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13. ABSTRACT (Maximum 200 words)

THIS INTERIM RESPONSE ACTION CONSISTS OF THE DESIGN AND CONSTRUCTION OR INSTALLATION OF IMPROVEMENTS AT THE NORTH BOUNDARY ALLUVIAL GROUND WATER INTERCEPT AND TREATMENT SYSTEM.

THIS DRAFT FINAL DECISION DOCUMENT PROVIDES SUMMARIES OF:

1. ALTERNATIVES CONSIDERED
2. SIGNIFICANT EVENTS LEADING TO THE INITIATION OF THE IRA
3. THE IRA PROJECT

4. THE APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS, STANDARDS, CRITERIA, OR LIMITATIONS (ARAR'S) ASSOCIATED WITH THE PROGRAM.

THE FOLLOWING IMPROVEMENTS ARE PLANNED:

1. RECHARGE UNITS IN AREAS NOT COVERED BY THE NEW RECHARGE TRENCHES
2. TREATMENT SYSTEM MODIFICATIONS TO REDUCE CARBON FINES IN PLANT EFFLUENT
3. TREATMENT SYSTEM MODIFICATIONS TO PROVIDE GREATER RELIABILITY
4. CLOSURE OF WELLS ACTING AS CONTAMINANT MIGRATION PATHWAYS.

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U.S. ARMY
MATERIEL COMMAND

— COMMITTED TO PROTECTION OF THE ENVIRONMENT —

**Final Decision Document
for the North Boundary System
Improvements Interim Response Action
at the Rocky Mountain Arsenal**

April 1989

Approved For	
By <i>[Signature]</i>	
Date <i>[illegible]</i>	
Approved For	
Dist	Area
<i>A-1</i>	<i>[illegible]</i>

Prepared For:

**U.S. Army Program Manager's Office For
Rocky Mountain Arsenal Contamination Cleanup**

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**FINAL DECISION DOCUMENT
FOR THE NORTH BOUNDARY SYSTEM
IMPROVEMENTS INTERIM RESPONSE ACTION
AT THE ROCKY MOUNTAIN ARSENAL**

April 1989

PREPARED FOR:

**U.S. ARMY PROGRAM MANAGER'S OFFICE FOR
ROCKY MOUNTAIN ARSENAL CONTAMINATION CLEANUP**

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FINAL DECISION DOCUMENT
FOR THE NORTH BOUNDARY SYSTEM
IMPROVEMENTS INTERIM RESPONSE ACTION
AT THE ROCKY MOUNTAIN ARSENAL

1.0 INTRODUCTION

The Interim Response Action (IRA) for the North Boundary System Improvements at Rocky Mountain Arsenal (RMA) is being conducted as part of the IRA Process for RMA in accordance with the June 5, 1987 report to the court in United States v. Shell Oil Co. and the proposed Modified Consent Decree dated June 7, 1988.

This IRA project consists of design and construction or installation of improvements at the North Boundary alluvial groundwater intercept and treatment system at RMA. The proposed Modified Consent Decree requires that there be an assessment of the need for improvement to the North Boundary system and implementation of any needed requirements.

Alternatives for improvement of the North Boundary System have been reviewed based on capability for timely execution, technical feasibility, compliance to the maximum extent practicable with applicable or relevant and appropriate requirements (ARARs), potential to be expanded and/or modified for incorporation into the Final Response Action, cost effectiveness among alternatives affording equivalent levels of protection and capability to be readily implemented.

2.0 HISTORY OF RMA NORTH BOUNDARY SYSTEM IMPROVEMENTS

Rocky Mountain Arsenal occupies over 17,000 acres, approximately 27 square miles, in Adams County, directly northeast of metropolitan Denver, Colorado (see Figure 1). The property was purchased by the government in 1942 for use in World War II to manufacture and assemble chemical warfare materials, such as mustard and lewisite, and incendiary munitions. From the 1950's to late 1969, RMA produced the nerve agent GB (isopropyl methylphosphonofluoridate). Since 1970, RMA has primarily been involved with the demilitarization of chemical warfare materials. In addition to these military activities, a major portion of the plant facilities were leased to private industries (including Shell Chemical Co.) beginning in 1946 for the manufacture of various insecticides and herbicides.

During the 1940's and 1950's aqueous industrial wastes generated at both the North Plants Area and the South Plants Area were routinely discharged into several unlined evaporation ponds (labeled Basins A, B, C, D, and E) located in the center of the installation (see Figure 2). Groundwater contamination was first suspected in the mid 1950's when minor crop damage occurred on land north and northwest of the Arsenal. This discovery of contaminants in the groundwater led to the placement of an asphalt liner in Basin F in 1956. At that time aqueous wastes in Basin A were transferred to Basin F and aqueous wastes produced thereafter were discharged directly to Basin F. Solid wastes were routinely disposed of in trenches and pits located adjacent to Basin A and the Plants Areas.

In the mid 1970's two organic compounds, diisopropylmethylphosphonate (DIMP) and dicyclopentadiene (DCPD) were identified in alluvial groundwater off the installation. (Alluvial groundwater beneath RMA generally flows from southeast to northwest. Figure 3 represents the generalized alluvial groundwater flow across RMA.) In 1975 the Colorado Department of Health (CDH) issued three administrative orders to cease and desist all unauthorized discharges to waters of the State, to take steps to clean up and control sources of DIMP and DCPD, and to initiate a groundwater monitoring program to determine the extent of DIMP and DCPD contamination.

Late in 1977 construction began on a pilot containment/treatment system 500 feet south of the RMA northernmost boundary (see Figure 2). The pilot system consisted of a bentonite slurry wall, groundwater dewatering wells, a granular activated carbon treatment facility and recharge wells. The goals of the pilot system were to establish the feasibility of the system in dealing with organic contaminants in the groundwater and to collect data required for the development of a full-scale containment system.

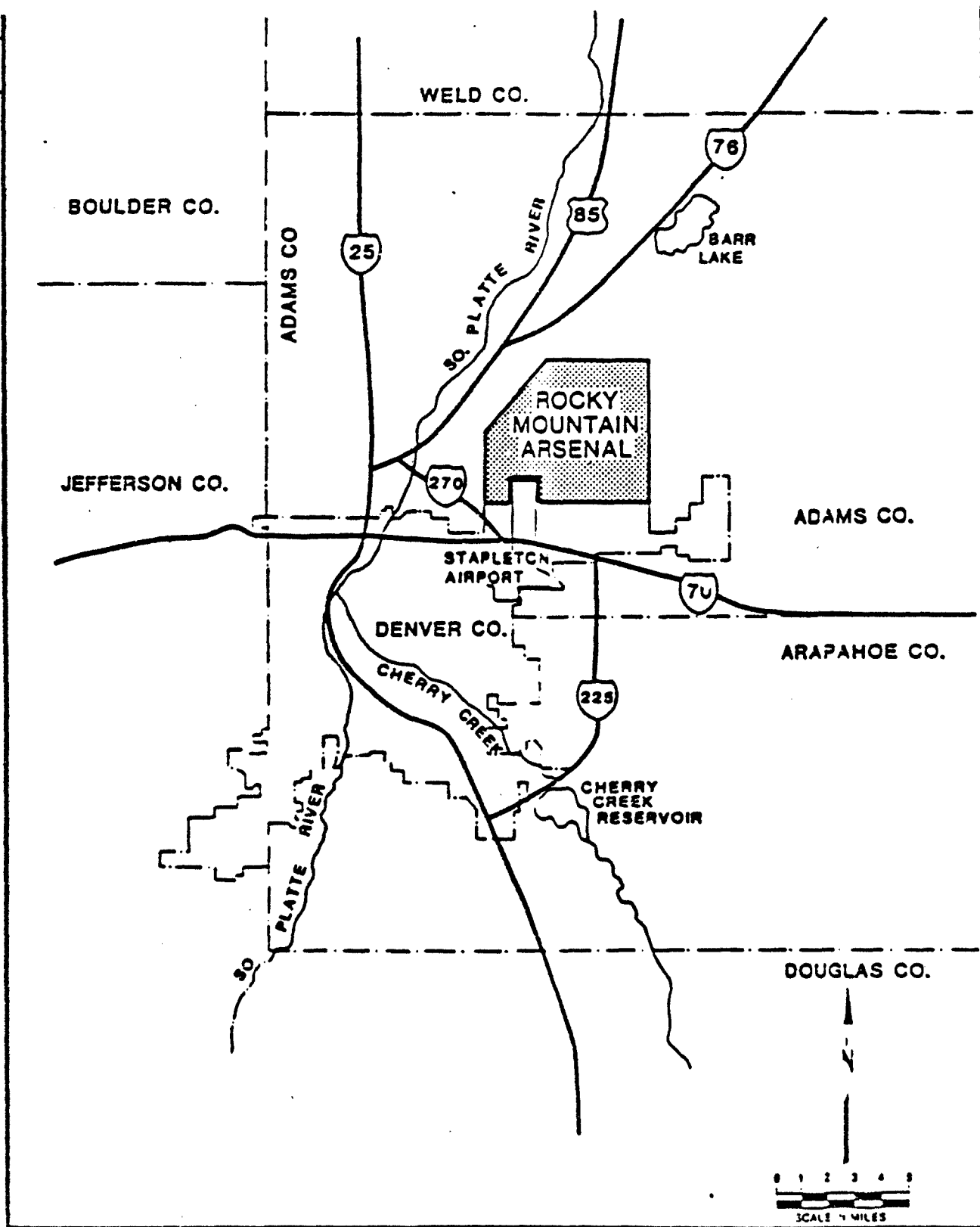


Figure 1. Rocky Mountain Arsenal Location Map
Source: (ESE, 1988)

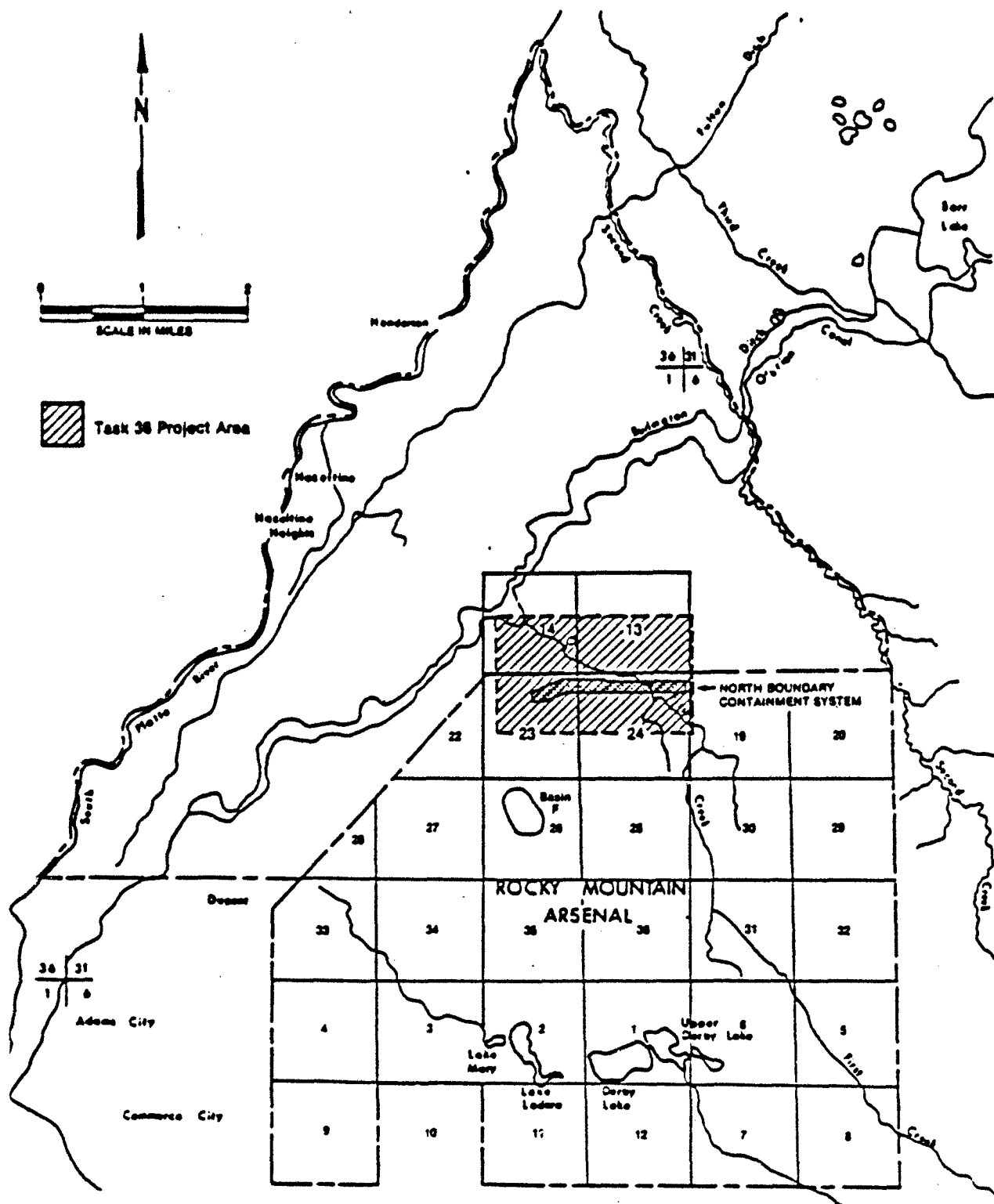


Figure 2. North Boundary Containment System Location Map
 Source: (ESE, 1988)

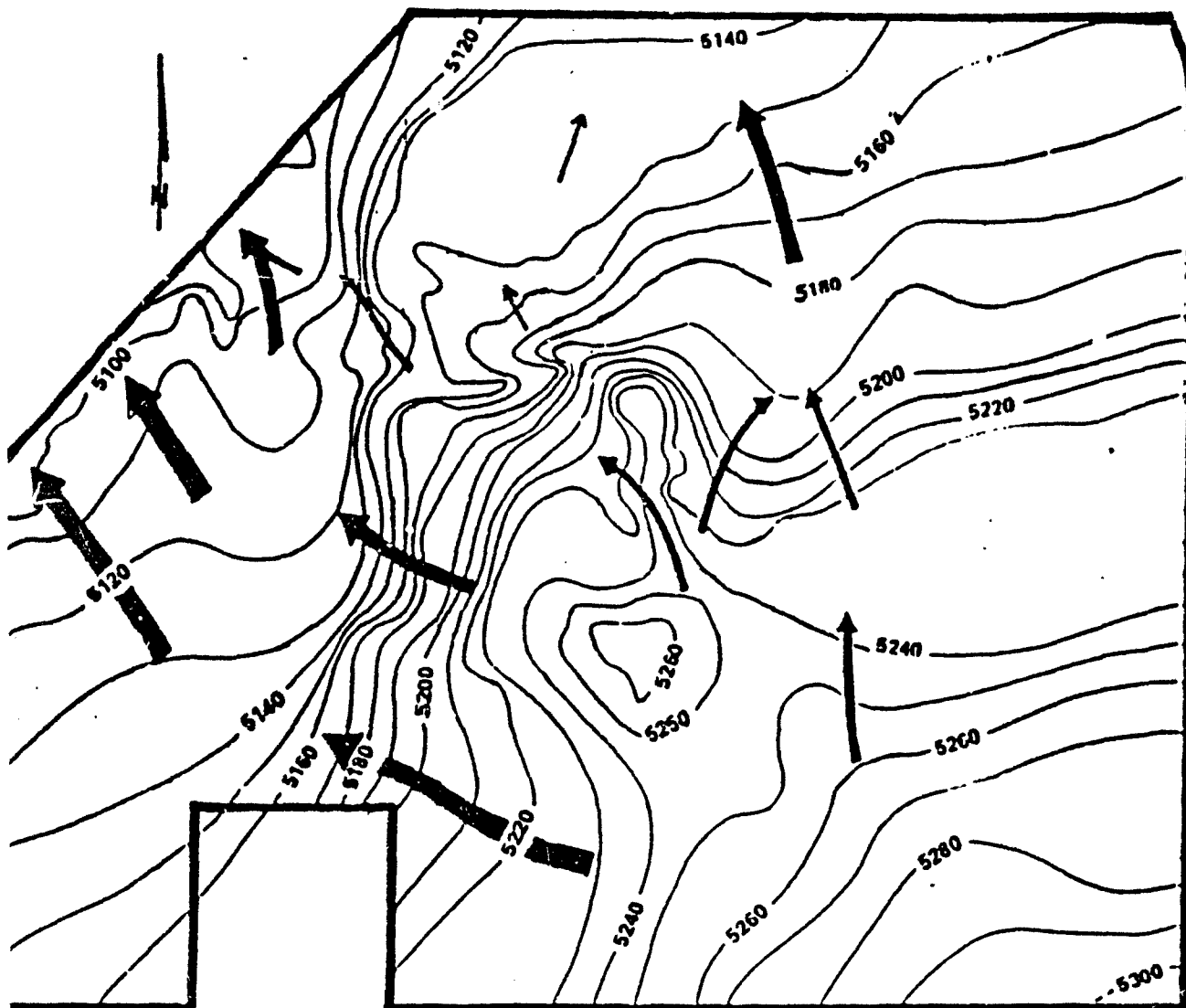


Figure 3. Generalized Alluvial Groundwater Flow Across RMA
 (NOTE: Arrows are indicative of direction of flow and do not represent flow quantities.)

In 1981 the pilot containment/treatment system was expanded. The slurry wall was extended to the east and the west. Additional dewatering wells were installed upgradient and recharge wells downgradient of the slurry wall. The treatment unit was expanded to treat the resulting additional flow. These expansions to the system were completed in January 1982.

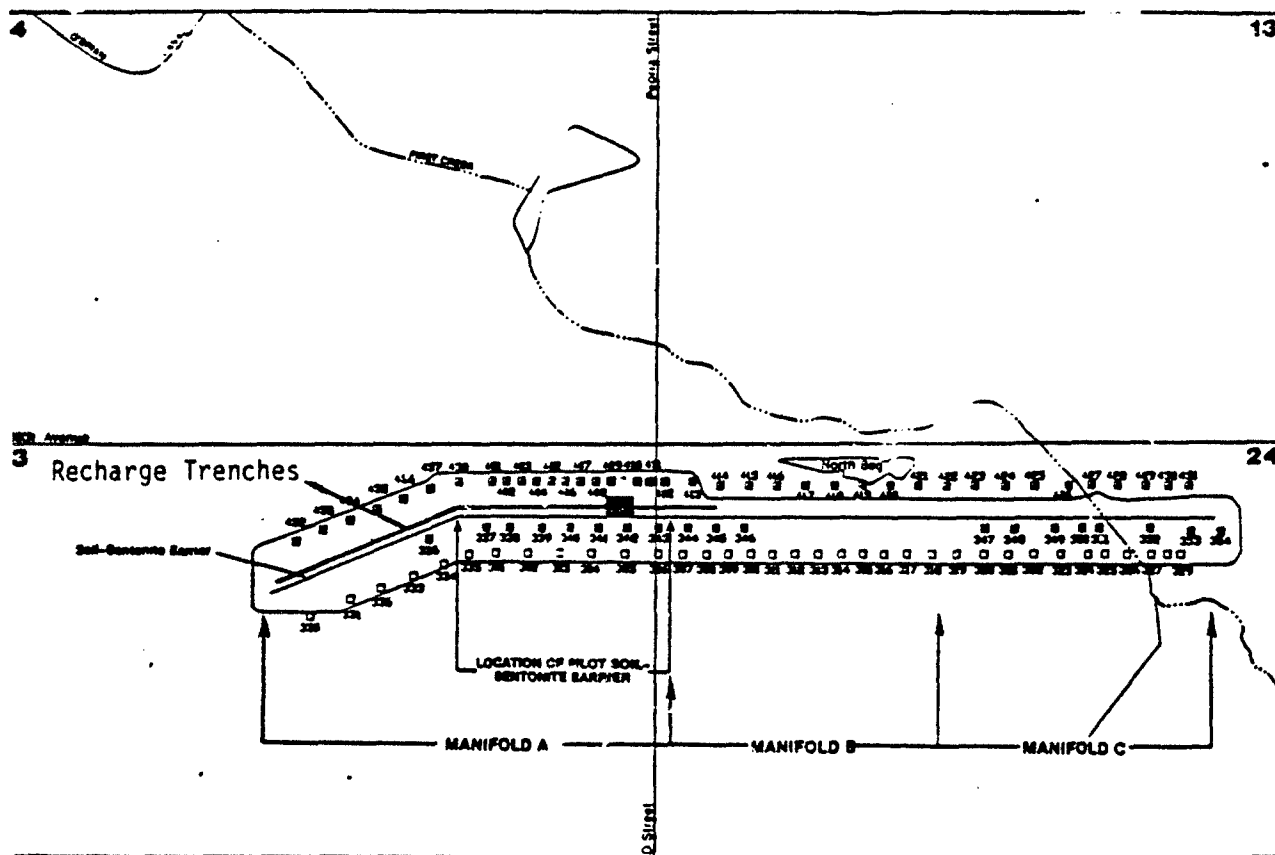
In December 1982, a Memorandum of Agreement (MOA) was entered into between the Colorado Department of Health, the U.S. Environmental Protection Agency, Shell Chemical Company, and the Army. The MOA initiated a cooperative development plan for a comprehensive remedy for the environmental situation at RMA.

A study was conducted between November 1984 and May 1985 that resulted in the submission of the North Boundary Containment/Treatment System Performance Report (Thompson, et al., 1985) in December 1985. The report evaluated the effectiveness of the expanded North Boundary System and identified the recommended engineering, operational and monitoring improvements to enhance long-term operations. This recommendation led to the initiation of Task 36 to assess specific components of the North Boundary System.

On February 1, 1988, a proposed Consent Decree was lodged in the U.S. v. Shell Oil Company with the U.S. District Court in Denver, Colorado. The proposed Consent Decree was revised after public comments were received, and a modified proposed Consent Decree was lodged with the Court on June 7, 1988. The Army and Shell Oil Company agreed to share costs of the cleanup that was to be developed and performed under the oversight of the U.S. Environmental Protection Agency, with numerous opportunities for comment by the State of Colorado. The long-term cleanup is a complex task that will take many years to complete. The Consent Decree specifies thirteen Interim Response Actions (IRAs) whose implementation has been determined to be necessary prior to implementation of the final remedial plan. The North Boundary System Improvements IRA is one of the thirteen.

2.1 DESCRIPTION OF RMA NORTH BOUNDARY SYSTEM

The existing North Boundary Containment/Treatment System (see Figure 4) consists of a soil-bentonite barrier, dewatering wells, a treatment plan, and recharge wells and trenches. The groundwater barrier is located parallel to and 500 feet south of the northern boundary of Rocky Mountain Arsenal. It is a 6,470-foot-long, 3-foot-wide, bentonite slurry wall keyed over most of its length into shale of the Denver formation at an average depth of approximately 30 feet. Fifty-four withdrawal wells are available to pump contaminated groundwater from south of the barrier to a carbon adsorption water treatment plant. The treatment plant includes a prefilter system for removing suspended solids; three 30,000 lb. capacity upflow, pulsed bed



- EXPLANATION**
- Recharge Wells
 - Alluvial Dewatering Wells
 - Deeper Dewatering Wells
 - Carbon Adsorption Treatment System



Figure 4. North Boundary Containment System

carbon adsorbers for removing certain organics; carbon transfer vessels; and both cartridge- and bag-type post-filters. Treated groundwater is discharged to a common sump prior to recharge. (Figure 5 is a schematic diagram of the treatment system.) Recharge to the alluvium is accomplished by 18 reinjection wells and 10 newly-installed gravel-filled trenches, approximately 160 feet long each and penetrating to the bedrock surface or a depth of 20 feet whichever is shallower, located north of the slurry wall.

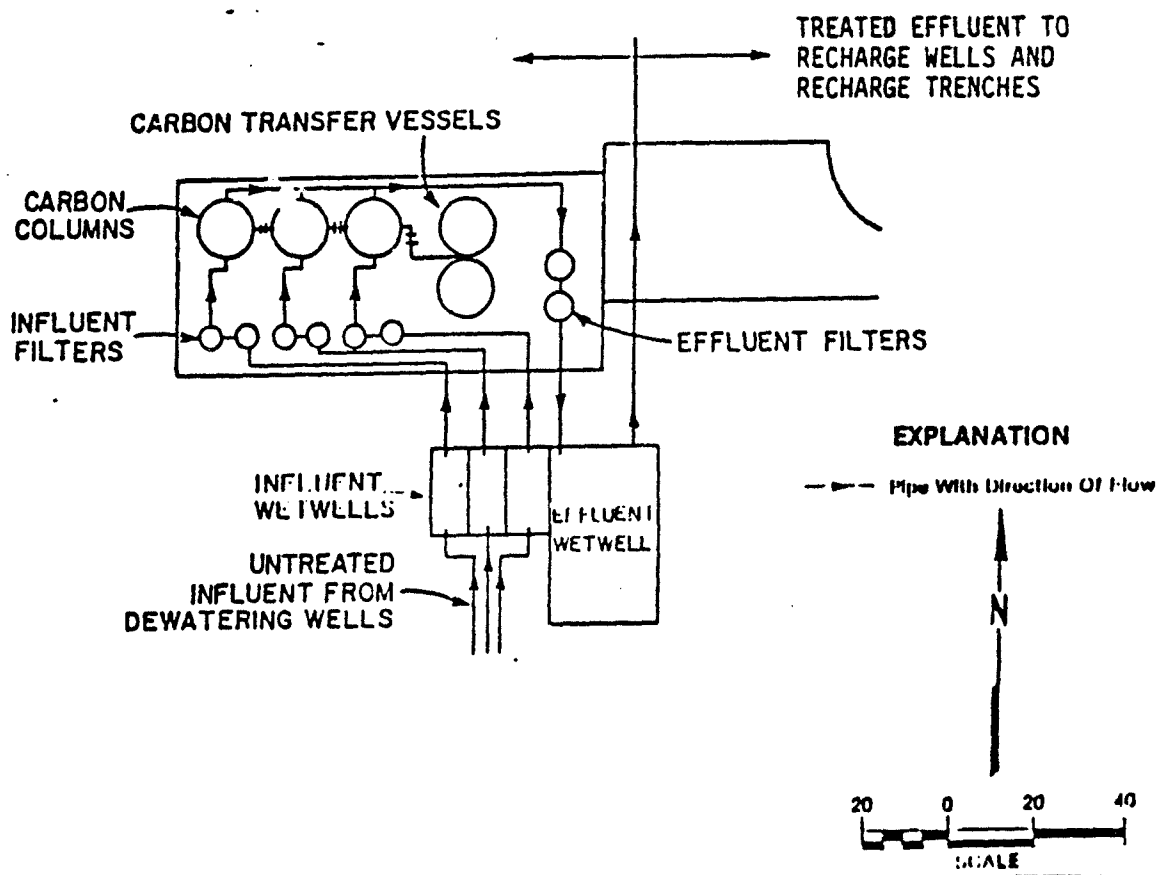


Figure 5. North Boundary System Treatment Facility

3.0 INTERIM RESPONSE ACTION OBJECTIVES

The goal of this IRA is timely implementation of modifications to the North Boundary System which will enhance this system's ability to prevent the release of organic contaminants at the North Boundary.

The following specific objectives for this IRA have been selected based on the Final Alternatives Assessment for this IRA (ESE, 1988):

- o Increase recharge capacity and improve recharge distribution to allow achievement of a reverse alluvial groundwater gradient along the full length of the physical barrier.
- o Reduce entrainment of granulated carbon fines into the recharge system to a practical minimum consistent with off-the-shelf equipment and accepted good operating practice for granulated carbon adsorbers.
- o Improve treatment system reliability and stream factor through modifications to equipment and operating procedures.
- o Close wells within the North Boundary System which may provide migration pathways from the alluvial aquifer to Denver Formation aquifers.
- o Improve through modifications and/or reconstruction the existing dewatering system wells to enhance/increase dewatering capacity and add additional dewatering components to further reduce water levels south of the physical barrier.

Specific criteria considered in order to achieve these objectives include:

- o Provide rapid response;
- o Use proven technology;
- o Compliance with any designated ARARs to the maximum extent practicable;
- o Consistency with the Final Response Action; and
- o Use the most cost-effective of equivalent treatment systems available.

In addition to the specific criteria, system improvements should adhere to good engineering practices.

4.0 INTERIM RESPONSE ACTION ALTERNATIVES

Interim Response Action alternatives that should increase the effectiveness of the North Boundary System were assessed in the November 1988 North Boundary System Component Response Action Assessment Draft Final Report (ESE, 1988).

The North Boundary System Component Assessment evaluated the effectiveness of each of the system components and evaluated the hydrogeology of the Upper Denver Formation. Operational modifications and system improvements or additions were proposed that would increase overall effectiveness of the system. Specific system components assessed were the recharge and dewatering system, the treatment system and the soil bentonite barrier.

The modifications and improvements identified were evaluated based upon their ability to protect human health and the environment, mitigate any threat to human health and the environment, technical feasibility, reasonableness of cost and ability to be implemented in a timely manner.

4.1 RECHARGE AND DEWATERING SYSTEM

Data obtained during the assessment indicated that the dewatering system is effective in intercepting the majority of the alluvial groundwater approaching the North Boundary System. However, lack of recharge capacity downgradient of the pilot portion of the soil-bentonite barrier has resulted in a large (up to 10 feet) head differential. In order to reduce the head differential across the barrier, recharge system modifications will be required, and some future modifications to the dewatering system could be beneficial.

It was determined (Program Manager's Staff Office, 1978) that limited recharge capacity and inadequate recharge distribution are the primary causes of the head difference across the soil-bentonite barrier. Consequently, various recharge system modification alternatives to increase recharge capacity were evaluated in the Proposed Interim Groundwater Recharge System, North Boundary Area, Draft Final Report (Lutton, 1988). Deep recharge trenches were chosen as the most appropriate and cost-effective alternative in the Final Decision Document for the Interim Response Action for the Improvement of the North Boundary System at Rocky Mountain Arsenal Via Construction of Groundwater Recharge Trenches (Program Manager RMA Contamination Cleanup, 1988).

The basis for the selection of deep recharge trenches was their large recharge capacity, feasibility of construction, minimal maintenance requirements, cost effectiveness and likelihood of meeting ARARs. The new trenches were completed and

became operational in November 1988. The basic design consisted of ten gravel-filled trenches approximately 160 feet long each, penetrating to the bedrock surface or a depth of 20 feet, whichever is shallower. The recharge water coming from the treatment plant would be fed from one end of each trench longitudinally through a plastic pipe near the top of the gravel phase. A permeable membrane would separate the gravel phase from soil backfill. A design objective is to achieve an initial maximum recharge rate of approximately 150 gpm. This will improve distribution of water on the western portion of the North Boundary System, where the hydraulic imbalance is the greatest. Head differences across the soil-bentonite barrier will be monitored to determine if the goal of a reverse gradient can be achieved in the field by recharge modifications alone.

Based on an operational performance of the new recharge trenches in the western sector of the North Boundary System, either recharge trenches, recharge wells or a combination of both will be installed along areas of the barrier not covered by the North Boundary System Trenches IRA. The selection of the type of additional recharge units will be made after an operational evaluation of the recharge trenches has been completed. Preliminary data indicate that operation of the new recharge trenches in the western section of the North Boundary System is reversing the hydraulic gradient across the barrier. However, the head differential across the barrier in the western section will be monitored to determine if this trend can be maintained based on recharge trenches alone. The improvement of recharge capacity and distribution along the eastern sector of the system will further achievement of the overall goal of a reverse gradient along the entire length of the barrier.

If the goal of a reverse gradient along the western section of the system is not achieved with the newly-installed recharge trenches, modifications to the dewatering system across from the trenches could be implemented. It is anticipated that the following dewatering system modifications would contribute to correction of the hydraulic imbalance:

- o Adjustment of probe settings and increases in pump sizes within existing dewatering wells, primarily in the western portion of the system (Manifold A), to allow groundwater to be temporarily withdrawn in excess of natural groundwater flow rates.
- o Installation of additional dewatering wells, strategically located in order to effectively reduce water levels upgradient of the soil-bentonite barrier. Interceptor trenches may also be considered for installation and could overcome some of the deficiencies of individual wells and allow for

significant drawdowns on the upgradient side of the barrier.

- o Reconstruction of existing dewatering wells that are currently screened primarily within low transmissivity cemented or fine-grained materials that limit dewatering capacity.

4.2 TREATMENT SYSTEM

Data collected during the North Boundary System Component Response Action Assessment Draft Final Report (ESE, 1988) indicated that the operation of the carbon adsorption system at the North Boundary has been very effective in removing organic contaminants from the plant influent to concentrations less than certified reporting limits. However, it was determined that plant operations may be contributing to clogging of the recharge wells and subsequently to a reduction in recharge system capacity.

The following treatment system modifications to remediate recharge well clogging or to improve treatment system efficiency were considered:

- o Modifications to the carbon washing/fine removal process, potentially including increased flow rates and longer washing periods during initial flushing of the carbon, to reduce the amount of carbon fines in the carbon when loaded into the adsorbers. Operation may also be modified to divert treated water through the spent carbon storage tank prior to putting the adsorber on-line. A cyclone filter has recently been installed at the blow case and its performance is being monitored. Future filtering improvements may be initiated following an evaluation of cyclone filter performance. These modifications may contribute to the reduction of carbon fines in the plant effluent.
- o Modifications to the pre- and post-filtering systems to improve their ability to handle solids, reduce system down-time, and minimize waste products and labor requirements.
- o Placement of a baffle in the effluent sump to enhance the settling out of carbon fines.
- o Modification of process equipment/piping to provide greater operational flexibility and reserve operating capacity to improve treatment reliability and reduce system down-time in case of failure. This would permit off-line maintenance of process equipment.

The assessment found that the treatment plant, as currently designed, is not intended to significantly reduce the concentrations of the inorganics present (i.e., Arsenic, Chloride, Fluoride and Sulfate). Since this IRA is intended to improve effectiveness of the existing treatment system which currently only affects a significant reduction in organic compounds, the necessity, if considered a requirement, to make significant reductions in inorganic levels would require a new treatment system.

Since development of a treatment strategy for inorganics at this time would unduly delay implementation of this IRA and the significant beneficial effects which can be obtained in the near term, the Army recommends that the assessment for the need for inorganic treatment be deferred until completion of the Off-Post Remedial Investigation/Feasibility Study (RI/FS) currently in the process of being finalized. The Off-Post RI/FS document will include development of information as the basis for setting off-post groundwater cleanup criteria for contaminants of concern including inorganics. At that time, the requirement for development of an inorganic treatment strategy for the North Boundary System in the near term versus the Final Response Action can be assessed based on information developed through the Off-Post RI/FS.

4.3 SOIL-BENTONITE BARRIER

The findings of the assessment found no significant deficiencies in the soil-bentonite barrier itself. The primary deficiency of the system is related to the depth of the pilot portion of the system where the high head differential has created the potential for flow beneath the barrier.

It is anticipated that use of the newly-installed recharge trenches will mitigate the hydraulic imbalance across the barrier and subsequently reduce the potential for groundwater flow beneath the barrier. Therefore, no near term modifications to the barrier are proposed.

4.4 EVALUATION OF DENVER FORMATION HYDROGEOLOGY

The upper Denver Formation has been identified as being potentially contaminated via lateral migration within the Denver Formation from contaminant source areas, natural downward migration from the contaminated alluvial aquifer in the vicinity of the North Boundary System, and vertical migration via man-made avenues from the alluvial aquifer (ESE, 1988). In addition, it has been determined that a potential exists for contaminated groundwater flows to by-pass the North Boundary System through the Denver Formation.

With respect to the vertical migration of contaminants, an initial response action that would reduce preferred pathways for contaminant movement from the alluvial aquifer to the Denver Formation is to identify and abandon through closure all wells completed across both aquifers and all wells screened across multiple geologic units within the Denver Formation. Candidate wells to be closed would include monitoring wells within the system area, Denver Formation dewatering wells and historic (pre 1942) wells.

If a zero or reverse gradient is achieved at the barrier through use of the recharge trenches or additional modifications to be implemented in the dewatering system, then the potential for contamination to by-pass the North Boundary System through the Denver Formation will be greatly reduced if not eliminated. No other remedial action concerning the Denver Formation would be appropriate in this IRA, however, because it is not the purpose of this IRA to remediate any potential contamination in the Denver Formation. Moreover, the need for remediation concerning any potential contamination cannot be determined at this time.

4.5 NO ACTION ALTERNATIVE

Section IX of the proposed Consent Decree (1988) states that the North Boundary System Improvements IRA has been determined to be both necessary and appropriate. Therefore, this alternative will not be considered.

5.0 CHRONOLOGY OF EVENTS

The significant events leading to the decision to make improvements to the North Boundary System are presented below.

<u>Date</u>	<u>Event</u>
December 1985	Completed <u>North Boundary Containment/Treatment System Performance Report</u> (Thompson, et al., 1985). Evaluated effectiveness of the expanded North Boundary System in preventing the off-post migration of contaminated groundwater. Evaluated historical, geologic, water level and chemical data that assisted in overall performance assessment. Identified and recommended engineering, operational and monitoring improvements to enhance long-term operation of the system.
September 1986	Initiated Task 36 to comprehensively assess specific components of the North Boundary Containment/Treatment System and to recommend long-term improvements for enhancing system performance.
June 1987	Completed <u>Rocky Mountain Arsenal North Boundary Containment/Treatment System Operational Assessment Report FY 85/FY 86</u> (Program Manager Staff Office, North Boundary System). Identified and documented system improvements, field studies and facility alterations conducted during FY 85 and FY 86. Identified and documented operational improvements to enhance long-term system effectiveness. Indicated need to improve the distribution of groundwater immediately north of the system.
June 1987	State of Colorado, Shell Oil Company, U.S. Environmental Protection Agency and U.S. Army agreed that thirteen Interim Response Actions (including North Boundary System Improvements) would be conducted.

Date	Event
February 1, 1988	Proposed Consent Decree (1988) lodged in the case of <u>U.S. v. Shell Oil Company</u> with the U.S. District Court in Denver, Colorado. The Consent Decree specified thirteen interim actions (including North Boundary System Improvements) to facilitate remediation activities.
April 29, 1988	Draft ARARs provided to organizations and State for review and comment.
May 27 and 31, 1988	Comments received from Shell and EPA concerning draft ARARs.
June 1, 1988	Comments received from State concerning draft ARARs.
June 7, 1988	Modified proposed Consent Decree lodged with Court, containing revisions based upon public comments.
July 6, 1988	<u>Issued Final Decision Document for the Interim Response Action for the Improvement of the North Boundary System at Rocky Mountain Arsenal via Construction of Groundwater Recharge Trenches</u> (Program Manager for Rocky Mountain Arsenal Contamination Cleanup, 1988). Documented decision to install recharge trenches at the North Boundary to improve recharge capacity.
September 20, 1988	Issued Final Implementation Document for the North Boundary System Recharge Trenches.
November 1, 1988	North Boundary System Recharge Trenches completed and operational.

<u>Date</u>	<u>Event</u>
November 23, 1988	<p>Issued <u>North Boundary System Component Response Action Assessment Draft Final Report</u> (ESE, 1988) to organizations and State for review and comment. Evaluated existing and new geotechnical, hydrogeologic regime at the North Boundary. Evaluated effectiveness of dewatering and recharge systems. Assessed integrity of the soil-bentonite barrier. Examined effectiveness of the carbon adsorption treatment plant. Recommended installation of recharge units that will reduce the existing hydraulic imbalance of the system on a long-term basis and improvements to the treatment plant to improve plant performance and reliability.</p>
January 6, 1989	<p>Comments received from Shell, EPA and State concerning <u>North Boundary System Component Response Action Assessment Draft Final Report</u>.</p>
February 2, 1989	<p>Issued <u>North Boundary System Component Response Action Assessment Final Report</u> (ESE, 1989) to organizations and State.</p>

6.0 SUMMARY OF THE INTERIM RESPONSE ACTION PROJECT

The North Boundary System Improvements Interim Response Action consists of modifications and additions to the alluvial groundwater extraction, treatment, and recharge processes in the North Boundary area. Certain specific modification and additional details dependent on design analysis for selection will be determined during the IRA final design and discussed in the Implementation Document.

6.1 SELECTED ALTERNATIVES

The following modifications and additions to the North Boundary System are planned for implementation:

- o Either recharge trenches, recharge wells or a combination of both type units will be installed along areas of the soil-bentonite barrier not covered by the North Boundary System Trenches IRA where there is a need to change hydrologic conditions to achieve a reverse gradient in the alluvium. This addition will further achievement of the overall goal of a reverse head differential along the entire length of the barrier.
- o Treatment system modifications and changes in plant operations will be implemented to do the following: reduce the generation of carbon fines during transfer operations; improve the removal of fines during carbon washing operations; reduce suspended solids (carbon fines, etc.) in plant influent, throughout the treatment process, and plant effluent; and improve overall system reliability and effectiveness.
- o Treatment system modifications and changes in plant operations will be implemented to provide improved operational flexibility, increased reserve operating capacity, reduced system down-time, and greater system reliability.
- o Wells within the system area that could be acting as contaminant migration pathways from the alluvial aquifer to the Denver Formation will be identified and closed, if not previously closed under the ongoing RMA Abandoned Well Closure IRA.
- o Modifications to the dewatering system may be implemented to include adjustment of probe settings and increases in pump sizes primarily in the western portion of the dewatering system and reconstruction of existing dewatering wells to enhance and increase dewatering capacity.

- o Additional dewatering wells or interceptor trenches may be installed in strategic locations to effectively reduce water levels south of the soil-bentonite barrier.

6.2 HEALTH AND SAFETY PLAN

A Health and Safety Plan has been developed for the prevention of occupational injuries and illnesses during field activities at RMA. This plan addresses health and safety requirements of contractors and their authorized subcontractors. Compliance with this plan will be compulsory and the contractors will be responsible for self-enforcement and compliance with this plan. The Health and Safety Plan was developed with consideration for known hazards as well as potential risks. Comprehensive environmental monitoring and site-specific personal protection are combined in an effort to best protect workers to the maximum extent practicable.

A site-specific Health and Safety Plan for work to be performed on the North Boundary System Improvements will be developed and included in the Implementation Document. This site-specific plan will contain specifics of monitoring plans, worker protection and work modifications to be conducted in the event that certain levels of contaminants are detected or if necessary to ensure worker health and safety.

7.0 IRA PROCESS

With respect to this IRA for the North Boundary System Improvements, the IRA process is as follows:

1. The Army prepared a Draft North Boundary System Component Response Action Assessment including a draft of the ARARs. This was submitted to the DOI, the State, and the other organizations for review and comment. Comments were submitted within 30 days after receipt of the draft assessment. After the close of the comment period, and in consideration of the comments received, the Army prepared and transmitted a final assessment to the DOI, the State, and other organizations.
2. The Army afforded the Department of Interior (DOI), the State, and other organizations an opportunity to participate, at the RMA Committee level, in the identification and selection of ARARs pertinent to this IRA. In this instance, the participation took the form of the Army's submitting the April 29, 1988 draft ARAR Document to the RMA Committee members.
3. The Proposed Decision Document for the North Boundary System Improvements IRA was subject to a 30-day public comment period including a public meeting that was held approximately two weeks into the comment period. The Proposed Decision Document was supported by an administrative record.
4. Promptly after close of the comment period, the Army transmitted to the DOI, the State, and other organizations this Draft Final Decision Document for the North Boundary System Improvements IRA.
5. Within 20 days after issuance of this Draft Final Decision Document for the North Boundary System Improvements IRA, an organization (including the State if it has agreed to be bound by the Dispute Resolution process, as required by the Consent Decree, or DOI under the circumstances set forth in the Consent Decree) may invoke Dispute Resolution.
6. After the close of the period for invoking Dispute Resolution (if Dispute Resolution is not invoked) or after the completion of Dispute Resolution (if invoked), the Army shall issue a Final Decision Document for the North Boundary System Improvements IRA with the supporting administrative record. Thereafter, the Decision Document will be subject to judicial review in accordance with Sections 113 and 121 of the

Comprehensive Environmental Response, Compensation and Liability Act of 1980, as amended, 42 U.S.C. Sections 9613, 9621.

7. Following issuance of the Final IRA Decision Document, Shell shall be the Lead Party responsible for designing and implementing the IRA in conformance with the Decision Document. Shell shall issue a Draft IRA Implementation Document to the DOI, the State, and the other organizations for review and comment. This Draft Implementation Document shall include final drawings and specifications, final design analyses, a cost estimate, and a schedule for implementation of the IRA.
8. As Lead Party for design and implementation of this IRA, Shell will issue the Final Implementation Document, as described above, and will be responsible for implementing the IRA in accordance with the IRA Implementation Document.

8.0 ARARs

8.1 ATTAINMENT OF ARARs

The interim action process reported to the court on June 5, 1987, in United States v. Shell Oil Co. provides that interim response actions (including this IRA to make improvements to the North Boundary System) shall, to the maximum extent practicable, attain standards, requirements, criteria, or limitations under any Federal environmental laws (or more stringent promulgated standards, requirements, criteria, or limitations under State environmental or facility siting laws that are legally applicable to the hazardous substance or pollutant or contaminant concerned or relevant and appropriate under the circumstances of the release or threatened release. A similar provision appears in Paragraph 9.7 of the proposed Consent Decree.

8.2 IDENTIFICATION AND SELECTION OF ARARs

Paragraph 9.7 of the Proposed Consent Decree provides that the organizations, DOI and the State shall have an opportunity to participate at the RMA Committee level, in the identification and selection of ARARs that may be applicable to the IRAs. The Army is to present its proposed decision on ARARs to the other organizations, DOI and the State prior to, or as part of, the draft IRA Assessment.

Draft ARARs were provided to the parties on April 29, 1988, and Shell and EPA submitted comments on May 27 and 31 respectively. The State provided comments on June 1, 1988. In response to these comments the Army revised these draft ARARs.

8.3 SELECTION OF ARARs AND DETERMINATION OF ARAR IMPACT

8.3.1 Ambient or Chemical-Specific ARARs

Ambient or chemical-specific requirements set health or risk-based concentration limits or ranges in various environmental media for specific hazardous substances, pollutants or contaminants. Such ARARs either set protective cleanup levels for the chemicals of concern in the designated media or indicate an appropriate level of discharge.

The objectives of this IRA are stated in Section 3.0. A further significant result of this IRA is to reduce the level of contamination in the groundwater flowing beyond the RMA North Boundary System and accelerate the cleanup of groundwater. This IRA will be implemented prior to the final remediation to be undertaken in the context of the On-Post Operable Unit ROD.

Because the North Boundary System is not a public water system and does not operate in navigable waters of the United

States, the standards established under the Safe Drinking Water Act and the Clean Water Act for drinking water are not applicable to this IRA. Where pertinent, these standards are treated as relevant and appropriate for purposes of this IRA.

For this IRA, the Army has selected an existing "off-the-shelf" technology for the interim remediation of the groundwater at the North Boundary System consistent with the IRA emphasis on speed of implementation, which the Army fully anticipates will also achieve, at the point of reinjection of the treated groundwater, the following selected limitations that are relevant and appropriate under the circumstances of the potential release for the CERCLA hazardous substances specified below:

(1) Arsenic

- (a) CERCLA Hazardous Substance: Yes
- (b) Groundwater RI Analyte: Yes
- (c) Groundwater IRA Standard: 50 ug/l.
(Source: 40 C.F.R. Section 141.11(b) (NPDW-MCL) and 40 C.F.R. Section 264.94(a)(2) (RCRA))

(2) Carbon Tetrachloride

- (a) CERCLA Hazardous Substance: Yes
- (b) Groundwater RI Analyte: Yes
- (c) Groundwater IRA Standard: 5 ug/l.
(Source: 40 C.F.R. Section 141.61(a), 52 Fed. Reg. 25716 (1987) (Effective Jan. 9, 1989) (NPDW-MCL))

(3) Chloroform

- (a) CERCLA Hazardous Substance: Yes
- (b) Groundwater RI Analyte: Yes
- (c) Groundwater IRA Standard: 100 ug/l.
(Source: 40 C.F.R. Section 141.12 (NPDW-MCL)
(Note that this is the total combined limit for this and all other trihalomethanes.))

(4) DECP

- (a) CERCLA Hazardous Substance: Yes
- (b) Groundwater RI Analyte: Yes
- (c) Groundwater IRA Standard: 0.20 ug/l.

(5) 1,2-Dichloroethane

- (a) CERCLA Hazardous Substance: Yes
- (b) Groundwater RI Analyte: Yes
- (c) Groundwater IRA Standard: 5 ug/l.
(Source: 40 C.F.R. Section 141.61(a); 52 Fed. Reg. 25716 (1987) (effective Jan. 9, 1989) (NPDW-MCL))

(6) DDT

- (a) CERCLA Hazardous Substance: Yes
- (b) Groundwater RI Analyte: Yes
- (c) Groundwater IRA Standard: 10 ug/l.
(Source: 40 C.F.R. Section 129.101(a)(3))

(7) Dieldrin

- (a) CERCLA Hazardous Substance: Yes
- (b) Groundwater RI Analyte: Yes
- (c) Groundwater IRA Standard: 0.12 ug/l.
(Source: 40 C.F.R. Section 129.100(a)(3) (TPES))

(8) Endrin

- (a) CERCLA Hazardous Substance: Yes
- (b) Groundwater RI Analyte: Yes
- (c) Groundwater IRA Standard: 0.2 ug/l.
(Source: 40 C.F.R. Section 141.12 (NPDW-MCL))

(9) Ethylbenzene

- (a) CERCLA Hazardous Substance: Yes
- (b) Groundwater RI Analyte: Yes
- (c) Groundwater IRA Standard: 1,400 ug/l.
(Source: 45 Fed. Reg. 79334 (1980) (AWQC))

(10) Fluoride

- (a) CERCLA Hazardous Substance: No
- (b) Groundwater RI Analyte: Yes
- (c) Groundwater IRA Standard: 4,000 ug/l.
(Source: 40 C.F.R. Section 141.11(c), 141.62(b) (NPDW-MCL))

(11) Hexachlorocyclopentadiene

- (a) CERCLA Hazardous Substance: Yes
- (b) Groundwater RI Analyte: Yes
- (c) Groundwater IRA Standard: 206 ug/l.
(Source: 45 Fed. Reg. 79336 (1980) (AWQC-Human Health))

(12) Tetrachloroethylene

- (a) CERCLA Hazardous Substance: Yes
- (b) Groundwater RI Analyte: Yes
- (c) Groundwater IRA Standard: 8 ug/l.
(Source: 45 Fed. Reg. 79341 (1980) (AWQC))

(13) Toluene

- (a) CERCLA Hazardous Substance: Yes
- (b) Groundwater RI Analyte: Yes
- (c) Groundwater IRA Standard: 14,300 ug/l.
(Source: 45 Fed. Reg. 79340 (1980) (AWQC))

(14) Trichloroethylene (TCE)

- (a) CASRN: 79016
- (b) CERCLA Hazardous Substance: Yes
- (c) Groundwater RI Analyte: Yes
- (d) Groundwater IRA Standard: 5 ug/l.
(Source: 40 C.F.R. Section 141.61(a); 52 Fed. Reg. 25716 (1987) (effective Jan. 9, 1989) (NPDW-MCL))

The Army has selected and anticipates attaining, the following limitation which is based upon the currently available health data for the listed compound for which there is no promulgated standard:

(1) DIMP

- (a) CERCLA Hazardous Substance: No
- (b) Groundwater RI Analyte: Yes
- (c) Groundwater IRA Standard: 600 ug/l.
(Source: Health Advisory on DIMP, Office of Drinking Water, U.S. Environmental Protection Agency, Washington, D.C., Dec. 1988)

Target analytes for this IRA for which promulgated standards were not found were Benzothiazole, Chloride, p-Chlorophenylmethyl Sulfur compounds, 1,2-Dichloroethylene, Dicyclopentadiene, Dithiane, Isodrin, and Sulfate. It is anticipated, based upon past data, that substantial treatment of the organic compounds will occur. The necessity for treatment for inorganics (i.e., Chloride and Sulfate) will be assessed in the near future as groundwater remedial action objectives are developed from results of the Off-Post RI/FS currently being finalized. ARARs identified have been compared to Off-Post RI/FS preliminary remedial action objectives and to the latest (1985) effluent data for the North Boundary System. For all organic compounds with ARARs identified, either the ARARs are consistent with Off-Post preliminary remedial action objectives or the North Boundary

System is currently treating influent to below detection limits for all other organic compounds of concern. Although preliminary remedial action objectives are not achieved for all inorganics present in the North Boundary System effluent, the need for treatment of inorganics at the boundary will have to be addressed in either the Final Remedial Action or as a new interim action beyond the scope of this IRA.

If further contaminants are identified after the implementation of the treatment system, chemical-specific ARARs will be reviewed for such contaminants and established, as appropriate.

8.3.2 Location-Specific ARARs

Location-specific requirements set restrictions on activities depending on the characteristics of the site or the immediate environment. These requirements function like action-specific requirements. Alternative remedial actions may be restricted or precluded depending on the location or characteristics of the site and the requirements that apply to it.

With respect to this interim action, the provisions of 40 CFR Section 141.5 (siting requirements for public water systems) are relevant and appropriate. The foregoing regulation does not constitute an "applicable" location-specific ARAR in this context. The North Boundary Intercept and Treatment System does not constitute a public water system, and no one is drinking or is to drink water to be treated by this system. The regulatory jurisdiction of the Safe Drinking Water Act and the National Primary Drinking Water Regulations is not applicable. In these circumstances, the nature of the remedial action is such that the jurisdictional prerequisites of these requirements are not met. Thus, the identified regulation is not applicable here.

Nevertheless, Section 141.5 does address location-specific problems or situations sufficiently similar to those encountered at the RMA CERCLA site so that use of this regulation is well-suited to the site and accordingly it will be treated as "relevant and appropriate." A requirement that is "relevant and appropriate" must be complied with to the same degree as if applicable. However, there is more discretion in this determination. It is possible for only part of a requirement to be considered "relevant and appropriate" in a given case.

Accordingly, the North Boundary System Improvements will be located to conform to the substantive siting provisions of 40 C.F.R. Section 141.5 as follows:

- (i) The improvements will not be located where there is a significant risk from earthquakes, floods, fires or

other disasters which could cause a breakdown of these improvements; and

- (ii) The improvements will not be located within the floodplain of a 100-year flood.

It should be noted that Paragraphs 23.2(e) and (f) of the proposed Consent Decree provide that:

- (e) Wildlife habitat(s) shall be preserved and managed as necessary to protect endangered species of wildlife to the extent required by the Endangered Species Act, 16 U.S.C. Sections 1531 et seq., migratory birds to the extent required by the Migratory Bird Treaty Act, 16 U.S.C. 703 et seq., and bald eagles to the extent required by the Bald Eagle Protection Act, 16 U.S.C. Section 668 et seq.
- (f) Other than as may be necessary in connection with a Response Action or as necessary to construct or operate a Response Action Structure, there shall be no change permitted in the geophysical characteristics of RMA that has a significant effect on the natural drainage at RMA for floodplain management, recharge of groundwater, operation and maintenance of Response Action Structures, and protection of wildlife habitat(s).

While these provisions are not ARARs, they obviously must be complied with for purposes of this IRA. Based on where the North Boundary System Improvements is located, as well as when the IRA will take place, the Army believes that this IRA will have no adverse impact on any endangered species or migratory birds, or on the protection of wildlife habitats.

After examining the area of the North Boundary System, the Army does not believe wetlands will be affected. The Army has initiated coordination with the U.S. Fish and Wildlife Service, who will monitor the area for impacts to wetlands.

8.3.3 Performance, Design or Other Action-Specific ARARs

8.3.3.1 Description

Performance, design or other action-specific requirements set controls or restrictions on particular kinds of activities related to the management of hazardous substances, pollutants, or contaminants. These action-specific requirements may specify particular performance levels, actions or technologies, as well as specific levels (or a methodology for setting specific levels) for discharged or residual chemicals.

8.3.3.2 Construction of Groundwater Intercept and Treatment System

(i) Air Emissions

On the remote possibility that there may be air emissions during the course of the construction of the North Boundary System Improvements, the Army has reviewed all potential ambient or chemical-specific air emission requirements. As a result of this review, the Army found that there are, at present, no National or State ambient air quality standards currently applicable or relevant and appropriate to any of the volatile or semi-volatile compounds and, even if such a release did occur, it would only be intermittent and of very brief duration (because the activity that produced the release would be stopped and modified appropriately if a significant air emission was detected by the contractor's air monitoring specialist). The Health and Safety Plan developed for this IRA will describe specific monitoring plans and work modification procedures.

The NESHAPS standards contained in 40 C.F.R. Part 61 were considered as potential ARARs and determined to be neither applicable nor relevant and appropriate. These regulations apply to stationary sources of these pollutants and are, therefore, not considered applicable to this IRA. These regulations were not considered relevant and appropriate to apply to this IRA because they were developed for emissions from manufacturing processes which are significantly dissimilar from the short-term construction activity which will take place during this IRA. The Army recognizes that when the actual stationary system is designed, it may include equipment which is somewhat similar to a stationary source and if the design does include such equipment, the NESHAPS standards will be reviewed again to determine whether they should be applied to the operations of this IRA.

(ii) Worker Protection

With respect to the workers directly participating in this IRA, the worker protection requirements of Section 126 of the Superfund Amendments and Reauthorization Act of 1986 shall be met through compliance with the OSHA interim final rule that appears in 51 Fed. Reg. 45654 (1986).¹

¹Although OSHA proposed a permanent final rule on August 10, 1987, 52 Fed. Reg. 29620, the comment period on this rule did not close until October 5, 1987. It should be noted that, pursuant to CERCLA Section 301(f), 42 U.S.C. Section 9651(f), the NCP is to be amended by December 11, 1988 to provide procedures for the protection of the health and safety of employees involved in response actions.

8.3.3.3 General Construction Activities

The following performance, design or other action-specific State ARARs have been preliminarily identified by the Army as relevant and appropriate to this portion of the IRA and more stringent than any applicable or relevant and appropriate Federal standard, requirement, criterion or limitation"

- (i) Colorado Air Pollution Control Commission Regulation No. 1, 5 CCR 100-3, Part III(d). (2) (b), "Construction Activities":
- (ii) Applicability - Attainment and Nonattainment Areas
- (iii) Applicable Emission Limitation Guideline

Both the 20% opacity and the no off-property transport emission limitation guidelines shall apply to construction activities; except that with respect to sources or activities associated with construction for which there are separate requirements set forth in this regulation, the emission limitation guidelines there specified as applicable to such sources and activities shall be evaluated for compliance with the requirements of Section III.D. of this regulation. (Cross Reference: Subsections e. and f. of Section III.D.2 of this regulation.)

- (iv) Control Measures and Operating Procedures

Control measures or operational procedures to be employed may include, but are not necessarily limited to, planting vegetation cover, providing synthetic cover, watering, chemical stabilization, furrows, compacting, minimizing disturbed area in the winter, wind breaks and other methods or techniques.

- (ii) Colorado Ambient Air Quality Standards, 5 C.C.R. 1001-14, Air Quality Regulation A, "Diesel-Powered Vehicle Emission Standards for Visible Pollutants":
 - a. No person shall emit or cause to be emitted into the atmosphere from any diesel-powered vehicle any air contaminant, for a period greater than 10 consecutive seconds, which is of such a shade or density as to obscure an observer's vision to a degree in excess of

40% opacity, with the exception of Subpart b below.

- b. No person shall emit or cause to be emitted into the atmosphere from any naturally aspirated diesel-powered vehicle of over 8,500 lbs gross vehicle weight rating operated above 7,000 feet (mean sea level), any air contaminant for a period greater than 10 consecutive seconds, which is of such a shade or density as to obscure an observer's vision to a degree in excess of 50% opacity.
- c. Diesel-powered vehicles exceeding these requirements shall be exempt for a period of 10 minutes, if the emissions are a direct result of a cold engine start-up and provided the vehicle is in a stationary position.
- d. This standard shall apply to motor vehicles intended, designed and manufactured primarily for use in carrying passengers or cargo on roads, streets and highways.

The following performance, design or action-specific State ARAR is applicable to this portion of the IRA and is more stringent than any applicable or relevant and appropriate Federal standard requirement, criterion or limitation:

(iii) Colorado Noise Abatement Statute, C.R.S. Section 25-12-103:

- a. Every activity to which this article is applicable shall be conducted in a manner so that any noise produced is not objectionable due to intermittence, beat frequency, or shrillness. Sound levels of noise radiating from a property line at a distance of 25 feet or more therefrom in excess of the db(A) established for the following time periods and zones shall constitute prima facie evidence that such noise is a public nuisance:

Zone	7:00 a.m. to	7:00 pm. to
	next 7:00 p.m.	next 7:00 a.m.
Residential	55 db(A)	50 db(A)
Commercial	60 db(A)	55 db(A)
Light Industrial	70 db(A)	65 db(A)
Industrial	80 db(A)	75 db(A)

- b. In the hours between 7:00 a.m. and the next 7:00 p.m., the noise levels permitted in subsection (1) of this section may be increased by 10 db(A) for a period of not to exceed 15 minutes in any 1-hour period.
- c. Periodic, impulsive, or shrill noises shall be considered a public nuisance when such noises are at a sound level of 5 db(A) less than those listed in Subpart a of this section.
- d. Construction projects shall be subject to the maximum permissible noise levels specified for industrial zones for the period within which construction is to be completed pursuant to any applicable construction permit issued by proper authority or, if no time limitation is imposed, for a reasonable period of time for completion of the project.
- e. For the purposes of this article, measurements with sound level meters shall be made when the wind velocity at the time and place of such measurement is not more than 5 miles per hour.
- f. In all sound level measurements, consideration shall be given to the effect of the ambient noise level created by the encompassing noise of the environment from all sources at the time and place of such sound level measurements.

In substantive fulfillment of Colorado Air Pollution Control Commission Regulation No. 1, this IRA will employ the specified methods for minimizing emissions from fuel burning equipment and construction activities. In substantive fulfillment of Colorado Diesel-Powered Vehicle Emission Standards, no diesel motor vehicles associated with the construction shall be operated in a manner that will produce emissions in excess of those specified in these standards.

The noise levels pertinent for construction activity provided in C.S.R. Section 25-12-103 will be attained in accordance with this applicable Colorado statute.

8.3.3.4 Removal of Soil

There are no action-specific ARARs that pertain to the drilling or excavation of soil during the construction of the North Boundary System Improvements IRA.

Although not an ARAR, removal of soil from the areas where the intercept and treatment system will be located will be performed in accordance with the procedures set forth in the Task No. 32 Technical Plan -- Sampling Waste Handling (November 1987) and EPA's July 12, 1985 memorandum entitled EPA Region VIII Procedure for Handling of Materials from Drilling, Trench Excavation and Decontamination During CERCLA RI/FS Operations at the Rocky Mountain Arsenal. In general, any soils generated by drilling or excavation during the course of this IRA, either at surface or subsurface, will be returned to the location from which they originated (i.e., last out, first in). Any materials remaining after backfilling has been completed that are suspected of being contaminated based on field screening techniques,² will be properly stored, sampled, analyzed, and ultimately disposed of as CERCLA hazardous wastes,³ as appropriate. Substantive RCRA provisions do not apply to soil that is returned to the location from which it originated.

For materials determined to be hazardous waste, substantive RCRA provisions are applicable to their management. These substantive provisions include, but are not limited to: 40 C.F.R. Part 262 (Subpart C, Pre-Transport Requirements), 40 C.F.R. Part 263 (Transporter Standards), and 40 C.F.R. Part 264 (Subpart I, Container Storage and Subpart L, Waste Piles). The specific substantive standards applied will be determined by the factual circumstances of the accumulation, storage or disposal techniques actually applied to any such material.

²The field screening techniques to be used to determine contamination are HNU, OVA, discoloration (visual) and odor. Readings or visual and odor inspection will be taken at least every five feet.

³It should be noted that the "land ban" provisions of RCRA Section 3004, 42 U.S.C. Section 6924, are not pertinent to any such excavated soil that is identified as contaminated. EPA guidance concerning this issue is currently being developed.

9.0 SCHEDULE

The Draft Implementation Document will be completed January 15, 1990. This milestone has been developed based upon the Final Assessment Document and the assumption that no dispute resolution will occur. The Draft Implementation Document will contain a schedule of milestones for the construction of the proposed system. If events occur which necessitate a schedule change or extension, the change will be incorporated in accordance with the discussion in Section XVIII of the RI/FS Process Document.

10.0 CONSISTENCY WITH THE FINAL RESPONSE ACTION

The purpose of this IRA is to make improvements to the North Boundary System to prevent the spread of contamination via aquifer flow pending implementation of the Final Response Actions. Although the Final Response Actions have not been selected at this time, this IRA will be consistent with and contribute to the efficient performance of Final Response Actions through the reduction of contaminant migration and the remedial effects on groundwater at RMA.

11.0 REFERENCES

Consent Decree. June 1988. United States of America, Plaintiff vs. Shell Oil Company, Inc., Defendant. In the United States District Court for the District of Colorado. Civil Action No. 83-2379.

RIC 88344R02

Environmental Science and Engineering (ESE), Inc. November 1988. North Boundary System Component Response Action Assessment Draft Final Report, Version 2.2, Volumes I, II and III.

RIC 88130R01

Lutton, R.C. February 1988. Proposed Interim Groundwater Recharge System, North Boundary Area, Draft Final Report. Geotechnical Laboratory, U.S. Army Corps of Engineers Waterways Experiment Station, Vicksburg, Mississippi.

Program Manager RMA Contamination Cleanup. July 1988. Final Decision Document for the Interim Response Action for the Improvement of the North Boundary System at Rocky Mountain Arsenal Via Construction of Groundwater Recharge Trenches.

RIC 87320R01

Program Manager's Staff Office. June 1987. Rocky Mountain Arsenal North Boundary Containment/Treatment System Operational Assessment Report. FY 85/FY 86. Vol. I, II and III. Program Manager Rocky Mountain Arsenal Contamination Cleanup. Aberdeen Proving Ground, Maryland.

RIC 83326R01

Rocky Mountain Arsenal Contamination Cleanup Program Management Team. September 1983. Selection of A Contamination Control Strategy for Rocky Mountain Arsenal. Volumes I and II. U.S. Army Toxic and Hazardous Materials Agency, Aberdeen Proving Ground, Maryland.

RIC 86078R01

Thompson, D.W., Environmental Laboratory, USAE Waterways Experiment Station, E.W. Barry and B.L. Anderson, Technical Operation Directorate, Rocky Mountain Arsenal, and J.H. May and R.L. Hunt, Geotechnical Laboratory, USAE Waterways Experiment Station. December 1985. North Boundary Containment Treatment System Performance Report, Volume I. Rocky Mountain Arsenal Information Center Reference Library, Rocky Mountain Arsenal, Denver, Colorado.

APPENDIX
COMMENTS AND RESPONSES



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION VII

999 18th STREET - SUITE 500
DENVER, COLORADO 80202-2405

Ref: 8HWM-SR

Mr. Donald L. Campbell
Office of the Program Manager
Rocky Mountain Arsenal
ATTN: AMXRM-PM
Commerce City, Colorado 80022-2180

FEB 22 1989

Re: Rocky Mountain Arsenal (RMA)
Proposed Decision Document for the
North Boundary System Improvements
Interim Response Action, January
1989.

Dear Mr. Campbell:

We have reviewed the above referenced document and have the
enclosed comments. Please contact me at (303) 293-1528, if you
have questions on this matter.

Sincerely,

Connally Mears

Connally Mears
EPA Coordinator
for Rocky Mountain Arsenal Cleanup

Enclosure

cc: Jeff Edson, CDH
David Shelton, CDH
Patricia Bohm, CAGO
Lt. Col. Scott P. Isaacson
Chris Hahn, Shell
R. D. Lundahl, Shell
David Anderson, DOJ

COMMENTS ON THE PROPOSED DECISION DOCUMENT FOR THE
NORTH BOUNDARY SYSTEM IMPROVEMENTS INTERIM RESPONSE ACTION
JANUARY 1989

1. The Decision Document implies that recharge trenches are the proper method to improve the recharge system. The trench design will eventually experience some plugging over time due to: 1. precipitation; 2. carbon fines; 3. bacterial growth and 4. air entrainment. The rate of plugging is, of course, difficult to predict. Also, the general trench design makes clean out next to impossible because there is no cleanout drain in the bottom of the trench. In the event that trenches are chosen as the recharge method, a cleanout mechanism should be provided.

2. The Decision Document does not address the existing injection wells and the potential for improving their injection rates. As mentioned in previous comments to RMA, experience indicates that some of the problems with low injection rates are probably related to injection procedure and poor well design (including development) in addition to the carbon fines. Before Denver Formation recharge wells are installed the technical problems with the alluvial recharge wells should be solved.

The Army should carry out a limited study on one or two of the newer recharge wells which had good pumping rates to determine if modifications to the injection procedure would result in higher rates. This information will be valuable in final design of the Off-Post IRA pumping and recharge well systems. The following items should be considered:

- a. remove piping from the well head and develop the well by extensive surging utilizing a combination of a surgeblock setting tool and a bailer;
- b. reinstall injection tubing with an on-off valve at the base of the inspection pipe (set below static water level);
- c. modify the system such that the entire pipe will always be full of water; the ideal operational system would allow the injection well to operate a syphon once the line is full and the valve in the base of the tail pipe has been opened; and
- d. install a well cut off valve which allows water in the well to rise within 3 feet of the surface before the tailpipe valve is closed.

3. Page 12, final two paragraphs. The Offpost RI has been completed. Inorganics results, starting on page 3-97 of the Offpost RI, indicate that certain compounds (fluoride, and nitrate) exceed their respective MCLs immediately downgradient of the NBS, and the Army letter of February 13, 1989, addresses recent treatment effluent data of concern. The Decision Document should acknowledge the above findings, should select ARARs for the inorganics, and should specifically discuss what inorganics treatment actions are contemplated, if the problem continues.

4. Page 20, Section 8.1. The language regarding attainment of ARARs should be expanded. The recent Basin A Neck IRA Draft Final Decision Document contains the appropriate language in that document's Section 8.1.

5. Page 23, Section 8.3.1. The text which follows the 16 listed ARARs needs to be revised to reflect the recent offpost and effluent inorganics data.

6. Page 23, Section 8.3.2. The second paragraph implies that the standards promulgated under neither the Safe Drinking Water Act nor the National Primary Drinking Water Regulations are applicable. It should be pointed out that there are offpost well users and that SACWSD will be placing public supply wells in the area downgradient of the NBS. The current language is inconsistent with other groundwater treatment IRAs and unacceptable to EPA. See also Section 5.2 of the CERCLA Compliance with Other Laws Manual for ARAR guidance. Revisions are necessary, as may be a meeting on this matter.

7. Page 24, Section 8.3.2. A final paragraph should be added to this section which discusses wetlands issues, including location-specific ARARs, related to this IRA. This may be particularly relevant because the North Bog may be affected by this IRA.

8. Regarding the chemical specific ARARs, the following standards should be considered, if and when they are promulgated:

(11) Ethylbenzene. The EPA proposed MCL (National Primary Drinking Water Regulations, 53 FR 31571 (1988)) is 700 ug/l and the State/CDH standard proposed in the organic standards for groundwater is 680 ug/l based on the lifetime health advisory. The proposed ARAR is 1,400 ug/l.

(13) Hexachlorocyclopentadiene. The CDH proposed standard is 49 ug/l based on the EPA IRIS database.

(14) Toluene. The EPA proposed MCL and CDH proposed organic standard are both 5 ug/l. This standard is four orders of magnitude less than the ARAR currently proposed based on the AWQC.

9. The FFA, paragraph 22.1 (b) (ii) provides for the assessment of the Irondale and the Northwest boundary systems, and the selection and implementation of any appropriate improvements as necessary. Please advise at what time the Army and Shell intend to pursue that effort.

RESPONSES TO COMMENTS BY THE U.S. ENVIRONMENTAL
PROTECTION AGENCY, REGION VIII, ON THE PROPOSED
DECISION DOCUMENT FOR THE NORTH BOUNDARY
SYSTEM IMPROVEMENTS INTERIM RESPONSE ACTION
JANUARY 1989

1. The Decision Document implies that recharge trenches are the proper method to improve the recharge system. The trench design will eventually experience some plugging over time due to: 1. precipitation; 2. carbon fines; 3. bacterial growth and 4. air entrainment. The rate of plugging is, of course, difficult to predict. Also, the general trench design makes clean-out next to impossible because there is no cleanout drain in the bottom of the trench. In the event that trenches are chosen as the recharge method, a cleanout mechanism should be provided.

RESPONSE: Consideration will be given to incorporating a cleanout mechanism in the future design of any additional recharge trenches that may be determined to be the best solution for improvement of the existing recharge system.

2. The Decision Document does not address the existing injection wells and the potential for improving their injection rates. As mentioned in previous comments to RMA, experience indicates that some of the problems with low injection rates are probably related to injection procedure and poor well design (including development) in addition to the carbon fines. Before Denver Formation recharge wells are installed the technical problems with the alluvial recharge wells should be solved.

The Army should carry out a limited study on one or two of the newer recharge wells which had good pumping rates to determine if modifications to the injection procedure would result in higher rates. This information will be valuable in final design of the Off-Post IRA pumping and recharge well systems. The following items should be considered:

- a. remove piping from the well head and develop the well by extensive surging utilizing a combination of a surgebloc setting tool and a bailer;
- b. reinstall injection tubing with an on-off valve at the base of the inspection pipe (set below static water level);
- c. modify the system such that the entire pipe will always be full of water; the ideal operational system would allow the injection well to operate a syphon once the line is full and the valve in the base of the tail pipe has been opened; and

- d. install a well cut off valve which allows water in the well to rise within 3 feet of the surface before the tailpipe valve is closed.

RESPONSE: The final alternatives assessment for this IRA (ESE, 1988) concluded that use of the existing recharge system of wells in its current condition or if improved would not achieve the required reverse gradient at the barrier. Therefore, recommendations were made for alternative recharge components, i.e., new wells, trenches and/or ponds. The Army agrees that prior to construction of any additional recharge wells, the past problem with recharge be fully assessed. Assessment of an existing recharge well is being considered in conjunction with ongoing studies of the particulate and recharge well injection problems. The assessment will also consider the four items identified in your comment. Improvement of the existing recharge wells will be considered, since the wells may be expected to be beneficial in the planned future usage as standby recharge components only.

3. Page 12, final two paragraphs. The Offpost RI has been completed. Inorganics results, starting on page 3-97 of the Offpost RI, indicate that certain compounds (fluoride, and nitrate) exceed their respective MCLs immediately downgradient of the NBS, and the Army letter of February 13, 1989, addresses recent treatment effluent data of concern. The Decision Document should acknowledge the above findings, should select ARARs for the inorganics, and should specifically discuss what inorganics treatment actions are contemplated, if the problem continues.

RESPONSE: This Decision Document will recognize the results of the Off-Post RI. This IRA is designed to improve the present system which was not implemented to treat inorganics. The Army anticipates, however, that the improvements will attain the ARAR for fluoride listed on page 13 of the Decision Document. Specific attainment levels for inorganics is beyond the scope of this IRA.

4. Page 20, Section 8.1. The language regarding attainment of ARARs should be expanded. The recent Basin A Neck IRA Draft Final Decision Document contains the appropriate language in that document's Section 8.1.

RESPONSE: The document has been modified accordingly.

5. Page 23, Section 8.3.1. The text which follows the 16 listed ARARs needs to be revised to reflect the recent offpost and effluent inorganics data.

RESPONSE: The text has been revised to reflect this comment.

6. Page 23, Section 8.3.2. The second paragraph implies that the standards promulgated under neither the Safe Drinking

Water Act nor the National Primary Drinking Water Regulations are applicable. It should be pointed out that there are offpost well users and that SACWSD will be placing public supply wells in the area downgradient of the NBS. The current language is inconsistent with other groundwater treatment IRAs and unacceptable to EPA. See also Section 5.2 of the CERCLA Compliance with Other Laws Manual for ARAR guidance. Revisions are necessary, as may be a meeting on this matter.

RESPONSE: The cited regulations, while relevant and appropriate, are not applicable because the NBS does not meet the definition of a "public water system." See 40 C.F.R. Section 141.2(e). The Army disagrees with the EPA's contention that CERCLA Compliance with Other Laws Manual, paragraph 5.2 identifies the cited regulations as applicable. Paragraph 5.2 states: "MCLs are the probable relevant and appropriate Federal standards for aquifers with Class I and Class II characteristics, i.e., irreplaceable, current, or potential drinking water sources."

7. Page 24, Section 8.3.2. A final paragraph should be added to this section which discusses wetlands issues, including location-specific ARARs, related to this IRA. This may be particularly relevant because the North Bog may be affected by this IRA.

RESPONSE: The document has been modified accordingly.

8. Regarding the chemical specific ARARs, the following standards should be considered, if and when they are promulgated:

- (11) Ethylbenzene. The EPA proposed MCL (National Primary Drinking Water Regulations, 53 FR 31571 (1988)) is 700 ug/l and the State/CDH standard proposed in the organic standards for groundwater is 680 ug/l based on the lifetime health advisory. The proposed ARAR is 1,400 ug/l.
- (13) Hexachlorocyclopentadiene. The CDH proposed standard is 49 ug/l based on the EPA IRIS database.
- (14) Toluene. The EPA proposed MCL and CDH proposed organic standard are both 5 ug/l. This standard is four orders of magnitude less than the ARAR currently proposed based on the AWQC.

RESPONSE: The ARAR process is dynamic. Proposed standards are subject to change before their enactment as promulgated standards. Proposed standards may not even become promulgated, or they may be revised upward or downward. The Army will consider those standards which have been finally promulgated.

If the proposed standards are finalized, the Army will reevaluate the standards for the compounds identified by the IRA.

9. The FFA, paragraph 22.1 (b) (ii) provides for the assessment of the Irondale and the Northwest boundary systems, and the selection and implementation of any appropriate improvements as necessary. Please advise at what time the Army and Shell intend to pursue that effort.

RESPONSE: Shell will complete its assessment of the Irondale System in approximately one month. The Army will do an annual assessment of the Northwest System. Copies will be provided when they become available.

STATE OF COLORADO

COLORADO DEPARTMENT OF HEALTH

4210 East 11th Avenue
Denver, Colorado 80220
Phone (303) 320-8333



Roy Romer
Governor

Thomas M. Vernon, M.D.
Executive Director

February 22, 1989

Mr. Donald Campbell
Office of the Program Manager for
Rocky Mountain Arsenal
Attn: AMXRM-PM, Bldg. 111
Commerce City, CO 80022-2180

Re: The Proposed Decision Document for the North Boundary System
Improvements Interim Response Action at the Rocky Mountain Arsenal,
January 1989.

Dear Mr. Campbell:

Enclosed are the State's comments on the Proposed Decision Document for
the North Boundary System Improvements Interim Response Action at the
Rocky Mountain Arsenal, January 1989.

The North Boundary System Component Response Action Assessment Final
Report, dated February 1989, indicates that the North Boundary
Containment System ("NBCS") is not preventing all contamination in this
area from migrating off-post due to the collection and recharge system
design deficiencies. Therefore, it is clear that containing groundwater
contamination at the boundaries of the Arsenal cannot be relied upon as
the primary remedy for treating contaminated groundwater at RMA. Efforts
will be needed to remediate on-post source areas which actively
contribute to groundwater contamination. New intercept and treatment
systems will need to be constructed within the boundaries of RMA to
remediate contaminated groundwater closer to the source areas.

The Assessment Report also indicates that modifications to the NBCS will
only represent a "band-aid" solution to the problem of preventing the
migration of contaminants in groundwater at the north boundary of RMA.
While the State supports the need to implement the alternatives discussed
in the Proposed Decision Document to increase the effectiveness of the
system, additional remedial activities will be necessary to ensure that
contamination no longer migrates off-post.

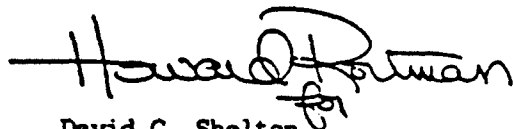
Mr. Donald Campbell

Page 2

February 22, 1989

If you have any questions regarding these comments, please contact Mr. Jeff Edson with this Division.

Sincerely,

A handwritten signature in dark ink, appearing to read "David C. Shelton". The signature is stylized with a large, looped "D" and a cursive "Shelton".

David C. Shelton
Director
Hazardous Materials and
Waste Management Division

GNB/lh

cc: Michael R. Hope
David L. Anderson
Chris Hahn
Edward J. McGrath

Connally Mears
Michael Gaydos
Lt. Col. Scott Isaacson
Tony Truschel

STATE COMMENTS ON THE PROPOSED DECISION DOCUMENT FOR THE
NORTH BOUNDARY SYSTEM IMPROVEMENTS INTERIM RESPONSE
ACTION AT THE ROCKY MOUNTAIN ARSENAL, JANUARY 1989

General Comments

1. The North Boundary Containment System ("NBCS") influent and effluent must be analyzed for non-target organic compounds. The analysis must be done bimonthly (every two weeks) for a least six months. Analysis must include a GC/MS scan for non-target compounds, tentatively identified compounds and unknowns. This information is needed to determine if these organic compounds are being injected into shallow groundwater off-post and whether the granular-activated carbon system is successful in treating all organic contaminants. Apparently such analyses have been performed. Therefore, the results should be made available to the State and the public.
2. A performance status report needs to be prepared on the effectiveness of the ten recharge trenches which were installed and are currently in operation at the NBCS. These trenches have been in use for more than two months. The performance evaluation is necessary to determine whether additional recharge trenches will be viable or beneficial. The Army needs to commit to a date for the completion of this report.
3. Reversing the hydraulic gradient in the alluvial aquifer may not eliminate the contaminant flux which is by passing the NBCS through the Denver Formation. The NBCS must be modified and operated such that contaminant migration into the off-post is eliminated.
4. The State has previously identified that chloride, sulfate and manganese have been detected in unacceptable concentrations in the NBCS's effluent. Inorganic contaminants, as well as organic contaminants, must be treated to applicable federal and state standards prior to injection into shallow groundwater which migrates off-post.
5. The chemical-specific ARARs included in this document are deficient and need to be corrected. No contamination above the applicable and relevant, or appropriate requirement, standards or criteria (ARARs) as defined in Section 121(d) of CERCLA can be permitted to migrate beyond the north boundary of the RMA. For many of the contaminants at the north boundary, the ARARs are the Maximum Contaminant Level Goals (MCLGs) established by the Safe Drinking Water Act (SDWA). For contaminants where the MCLGs are set at zero, or where Maximum Contaminant Levels (MCLs) or MCLGs have not been proposed or established, the NBCS treatment plant must be operated to at least attain concentration levels of a contaminant that reflect a 10^{-6} Cancer Assessment Group (CAG) cancer risk factor over a 70 year lifetime exposure. If no MCLG, MCL or CAG cancer risk value exists for a particular contaminant in the groundwater, the treatment plant must be operated to at least attain a level or standard that will not exceed the level established for a lifetime exposure for such contaminants in an EPA Office of Drinking Water Health Advisory (HA) or in an EPA Health Effects Assessment (HEA).

When chemical contaminants have an MCLG, CAG 10^{-6} risk, HA or HEA standard below minimum detection limits, and a determination is made that it is technically impracticable from an engineering perspective to meet that standard, the minimum detection limits should be used as the standard for operation of the plant. For chemical contaminants where there are no established or proposed standards as described above, minimum detection limits should be used as the standard for operation of the plant until sufficient toxicological information exist to establish a health based standard.

6. As the State has previously commented, wells which may be contributing to Denver Formation contamination should be identified and closed immediately. If the wells are to be closed pursuant to the abandoned well interim action, the wells at the north boundary must be given top priority for closure.

Specific Comments

1. Pg. 6, para. 3 The word "several" should be replaced with the word "many". The corrected sentence should read as follows. "The long term cleanup is a complex task that will take many years to complete". This change more accurately depicts the reality of site conditions.
2. Pg. 15, para. 2; and Pg. 20, para. 2 The Colorado Attorney General's Office provided comments concerning the draft ARARs to David L. Anderson in a letter dated June 1, 1988.
3. Pgs 20-23, Section 8.3.1 The State has identified promulgated chemical-specific ARARs on several occasions. However, the Army has consistently ignored all promulgated State statutes and regulations. This practice is inconsistent with U.S. EPA actions at Colorado CERCLA sites and is not consistent with Section 121(d) of CERCLA. To the extent the State promulgated standards are more stringent than the federal standards, the State standards must be met. Attachment I contains State identified chemical-specific standards (ARARs).

ATTACHMENT 1

STATE IDENTIFICATION OF CHEMICAL-SPECIFIC ARARS AT RMA

REFERENCE

- (1) Colorado Basic Standards for Ground Water, 5 CCR 1002-8, Section 3.11.0 - 3.11.9 (in particular Tables 1, 2, and 3).
- (2) Colorado Basic Standards and Methodologies, 5 CCR 1002-8, Section 3.1.0 - 3.1.20 (in particular Section 3.1.11).
- (3) Federal Safe Drinking Water Act (in particular Maximum Contaminant Level Goals - MCLGs).
- (4) Federal Safe Drinking Water Act (in particular Maximum Contaminant Levels - MCLs).
- (5) Federal Clean Water Act (in particular Water Quality Criteria for Protection of Human Health).

Chemical	Abbreviation	Water Quality Standard (Reference) all values in ug/l		
Aldrin	ALDRN	0(2)	0.000074(5)	
Arsenic	AS	50(1)	50(4)	
Atrazine	ATZ	0(2)		
Barium	BA	1000(1)	1000(4)	
Benzene	C6H6		0(3)	5(4)
Benzothiazole	BTA/BTZ	0(2)		
Bicycloheptadiene	BCHPD	0(2)		
Bromoform	CHBR3	100(4)	note: total trihalomethanes	
Cadmium	CD	10(1)	5(3) *	10(4)
Carbon tetrachloride	CCL4		0(3)	5(4)
Chlordane	CLDAN	0.004(1)	0.00046(5)	
Chloride	CL	250,000(1)		
Chlorobenzene	CLC6H5	0(2)		
Chloroform	CHCL3	100(4)	note: total trihalo-methanes 0.19(5)	
Chlorophenylmethyl sulfide	CPMS	0(2)		
Chlorophenylmethyl sulfone	CPMSO2	0(2)		
Chlorophenylmethyl sulfoxide	CPMSO	0(2)		
Chromium	CR	50(1)	1.2(3) *	50(4)
Copper	CU	200(1)	1300(3) *	
1,1-Dibromochloropropane	DBCP	0(2)	0(3)	
Dichlorobenzenes	CL2BZ		75(3)	75(4)
Dichlorodiphenylethane	PPDDE	0(2)		

<u>Chemical</u>	<u>Abbreviation</u>	<u>Water Quality Standard</u> (Reference) <u>all values in ug/l</u>		
Dichlorodiphenyl trichloroethane	PPDDT	0(2)		
1,1-Dichloroethane	11DCLE	0(2)		
1,2-Dichloroethane	12DCLE		0(3)	5(4)
1,1-Dichloroethylene	11DCE		7(3)	7(4)
1,2-Dichloroethylene	12DCE	0(2)		
2,4-Dichlorophenoxyacetic acid	24D		7(3)	100(4)
Dicyclopentadiene	DCPD	0(2)		
Dieldrin	DLDRN	0(2)	0.000071(5)	
Diisopropylmethyl phosphonate	DIMP	0(2)		
Dimethyldisulfide	DMDS	0(2)		
Dimethylmethylphosphate	DMMP	0(2)		
Dithiane	DITH	0(2)		
Endrin	ENDRN	0.2(1)	0.2(4)	
Ethylbenzene	ETC6H5	0(2)	680(3)*	
Fluoride	F	4000(1)	4000(4)	
Hexachlorocyclopentadiene	CL6CP	0(2)	210(5)	
Iron	FE	300(1)		
Isodrin	ISODR	0(2)		
Lead	PB	50(1)	20(3)*	50(4)
Lindane	LIN	4(1)	0.2(3)*	4(4)
Malathion	MLTHN	0(2)		
Manganese	MN	50(1)		
Mercury	HG	2(1)	2(4)	

<u>Chemical</u>	<u>Abbreviation</u>	Water Quality Standard (Reference) <u>all values in ug/l</u>		
Methoxychlor	MEXCLR	100(1)	100(4)	
Ethylene chloride	CH2CL2	0(2)		
Methylisobutyl ketone	MIBK	0(2)		
Nitrite	NIT	1000(1)		
Nitrate		10,000(1)	10,000(4)	
Oxathiane	OXAT	0(2)		
PH	PH	6.5 - 8.5(1)		
Selenium	SE	10(1)	10(4)	
Silver	AG	50(1)	50(4)	
Silvex	SILVEX	10(1)	10(4)	
Sulfate	SO4	250,000(1)		
Supona	SUPONA	0(2)		
Tetrachloroethylene	TCLEE	0(2)	0(3) *	
Toluene	MEC6H5	0(2)	2000(3) *	
Toxaphene	TXPHEN	5(1)	0(3) *	5(4)
1,1,1-Trichloroethane	111TCE		200(3)	200(4)
1,1,2-Trichloroethane	112TCE	0(2)	0.6(5)	
Trichloroethylene	TRCLE		0(3)	5(4)
Unknown	UNK049	0(2)		
Unknown	UNK080	0(2)		
Unknown	UNK104	0(2)		
Unknown	UNK110	0(2)		
Unknown	UNK118	0(2)		

<u>Chemical</u>	<u>Abbreviation</u>	Water Quality Standard (Reference) <u>all values in ug/l</u>
Unknown	UNK129	0(2)
Xylene	13DMB	0(2)
Ylenes	XYLEN	0(2)
Inc	ZN	500(1)

Proposed Maximum Contaminant Level Goals

RESPONSES TO COMMENTS BY THE STATE OF COLORADO
ON THE PROPOSED DECISION DOCUMENT FOR THE
NORTH BOUNDARY SYSTEM IMPROVEMENTS
INTERIM RESPONSE ACTION
JANUARY 1989

General Response to Transmittal Letter:

The improvements to the North Boundary System is only one part of the program to control the off-post migration of contaminants in groundwater and to remediate area groundwater. Other IRAs within the Arsenal boundaries include construction of groundwater treatment systems in the vicinity of Basin A and north of Basin F. An IRA is under development for groundwater treatment north of the Arsenal. The Final Response Action will address comprehensive remedial actions.

General Comments

1. The North Boundary Containment System ("NBCS") influent and effluent must be analyzed for non-target organic compounds. The analysis must be done bimonthly (every two weeks) for at least six months. Analysis must include a GC/MS scan for non-target compounds, tentatively identified compounds and unknowns. This information is needed to determine if these organic compounds are being injected into shallow groundwater off-post and whether the granular-activated carbon system is successful in treating all organic contaminants. Apparently such analyses have been performed. Therefore, the results should be made available to the State and the public.

RESPONSE: As previously indicated in response to comments from Colorado Department of Health (CDH) on the Task 36 North Boundary System Component Response Action Assessment, a cursory review of influent and effluent analyses of samples collected from the NBCS during January 1988 indicated that all tentatively identified non-target organic compounds are being effectively removed by the carbon adsorption system. This data will be made available to CDH separately.

2. A performance status report needs to be prepared on the effectiveness of the ten recharge trenches which were installed and are currently in operation at the NBCS. These trenches have been in use for more than two months. The performance evaluation is necessary to determine whether additional recharge trenches will be viable or beneficial. The Army needs to commit to a date for the completion of this report.

RESPONSE: As indicated previously in response to CDH comments on the assessment document, a status report will be provided separately to CDH to describe startup and an evaluation of the effectiveness of the ten recharge trenches upon completion of the ongoing evaluation.

3. Reversing the hydraulic gradient in the alluvial aquifer may not eliminate the contaminant flux which is by-passing the NBCS through the Denver Formation. The NBCS must be modified and operated such that contaminant migration into the off-post is eliminated.

RESPONSE: Preliminary data indicate that operation of the new recharge trenches in the western section of the North Boundary System is reversing the hydraulic gradient across the barrier. Assuming this trend can be maintained in the future by use of the recharge trenches, alone, the Army believes the potential for contamination to by-pass the North Boundary System through the Denver Formation will be greatly reduced if not eliminated. No other remedial action concerning the Denver Formation would be appropriate in this IRA, however, because it is not the purpose of this IRA to remediate any potential contamination in the Denver Formation. Moreover, the need for remediation concerning any potential contamination in the Denver Formation cannot be determined at this time.

4. The State has previously identified that chloride, sulfate and manganese have been detected in unacceptable concentrations in the NBCS's effluent. Inorganic contaminants, as well as organic contaminants, must be treated to applicable Federal and State standards prior to injection into shallow groundwater which migrates off-post.

RESPONSE: The Army anticipates, based on past data, that substantial treatment of organics will occur. The necessity for treatment of inorganics such as chloride and sulfate will be assessed in the near future as groundwater remedial objectives are developed from the results of the Off-Post RI/FS.

5. The chemical-specific ARARs included in this document are deficient and need to be corrected. No contamination above the applicable and relevant, or appropriate requirement, standards or criteria (ARARs) as defined in Section 121(d) of CERCLA can be permitted to migrate beyond the north boundary of the RMA. For many of the contaminants at the north boundary, the ARARs are the Maximum Contaminant Level Goals (MCLGs) established by the Safe Drinking Water Act (SDWA). For contaminants where the MCLGs are set at zero, or where Maximum Contaminant Levels (MCLs) or MCLGs have not been proposed or established, the NBCS treatment plant must be operated to at least attain concentration levels of a contaminant that reflect a 10^{-6} Cancer Assessment Group (CAG) cancer risk factor over a 70-year lifetime exposure. If no MCLG, MCL or CAG cancer risk value exists for a

particular contaminant in the groundwater, the treatment plant must be operated to at least attain a level or standard that will not exceed the level established for a lifetime exposure for such contaminants in an EPA Office of

Drinking Water Health Advisory (HA) or in an EPA Health Effects Assessment (HEA).

When chemical contaminants have an MCLG, CAG 10^{-6} risk, HA or HEA standard below minimum detection limits, and a determination is made that it is technically impracticable from an engineering perspective to meet that standard, the minimum detection limits should be used as the standard for operation of the plant. For chemical contaminants where there are no established or proposed standards as described above, minimum detection limits should be used as the standard for operation of the plant until sufficient toxicological information exist to establish a health based standard.

RESPONSE: The State appears to make no differentiation between an interim response action and a final remedy with this approach. The Army is aware of no guidance from EPA which would apply MCLGs to interim response actions. From a policy perspective, it appears that application of MCLGs to IRAs would be a disincentive to conduct IRAs, the party preferring to develop a single remedial system which might be capable of attaining such standards regardless of the time required. In the interim, no beneficial remediation would occur. In determining which standards are relevant and appropriate to apply to a specific IRA the Army considers the particular facts surrounding that action. This IRA will treat groundwater which will be released in an area where there is no human exposure. This groundwater will flow towards other treatment systems during the following years, where it will be treated again. Under these circumstances, it has been determined by the Army that MCLGs are not relevant and appropriate to apply in the context of this interim action. This approach is consistent with the statutory provision to apply such standards where they are relevant and appropriate under the circumstances. CERCLA Section 121(d)(2)(A).

6. As the State has previously commented, wells which may be contributing to Denver Formation contamination should be identified and closed immediately. If the wells are to be closed pursuant to the abandoned well interim action, the wells at the north boundary must be given top priority for closure.

RESPONSE: Wells in the area of the North Boundary System that may be contributing to Denver Formation contamination are being closed in early 1989 pursuant to the Abandoned Well Closure IRA.

Specific Comments

1. Pg. 6, para. 3 The word "several" should be replaced with the word "many." The corrected sentence should read as follows: "The long term cleanup is a complex task that will take many years to complete." This change more accurately depicts the reality of site conditions.

RESPONSE: The text has been changed to reflect this comment.

2. Pg. 15, para. 2; and Pg. 20, para. 2 The Colorado Attorney General's Office provided comments concerning the draft ARARs to David L. Anderson in a letter dated June 1, 1988.

RESPONSE: The text has been changed on both pages cited to reflect this comment.

3. Pgs 20-23, Section 8.3.1 The State has identified promulgated chemical-specific ARARs on several occasions. However, the Army has consistently ignored all promulgated State statutes and regulations. This practice is inconsistent with U.S. EPA actions at Colorado CERCLA sites and is not consistent with Section 121(d) of CERCLA. To the extent the State promulgated standards are more stringent than the federal standards, the State standards must be met. Attachment I contains State identified chemical-specific standards (ARARs).

RESPONSE: The Army has reviewed the State standards identified in Attachment I to the State's comments concerning this proposed decision document. The Army previously provided responses concerning the determination that the Colorado Basic Standards for Ground Water, 5 CCR 1002-8 and Colorado Basic Standards and Methodologies, 5 CCR 1002-8, were neither applicable nor relevant and appropriate to apply in the context of this IRA in response to the State's comments (June 1, 1988) on the Draft ARAR document for this IRA and the State is referred to that discussion.

Shell Oil Company



One Shell Plaza
P.O. Box 4320
Houston, Texas 77210

February 21, 1989

Office of the Program Manager for Rocky Mountain Arsenal
ATTN: AMXRM-PM: Mr. Donald L. Campbell
Rocky Mountain Arsenal, Building 111
Commerce City, Colorado 80022-2180

Dear Mr. Campbell:

Enclosed herewith are Shell Oil's comments on the Proposed Decision Document for the North Boundary System Improvements Interim Response Action at the Rocky Mountain Arsenal, January 1989.

Sincerely,

A handwritten signature in dark ink, appearing to read "R. D. Lundahl", written over the typed name.

R. D. Lundahl
Manager Technical
Denver Site Project

RDL:ajg

Enclosure

cc: (w/enclosure)

Office of the Program Manager for Rocky Mountain Arsenal
ATTN: AMXRM-PM: Col. Wallace N. Quintrell
Bldg. E-4460
Aberdeen Proving Ground, Maryland 21010-5401

Office of the Program Manager for Rocky Mountain Arsenal
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Rocky Mountain Arsenal, Building 111
Commerce City, CO 80022-2180

Office of the Program Manager for Rocky Mountain Arsenal
ATTN: AMXRM-RP: Mr. Kevin T. Blose
Rocky Mountain Arsenal, Building 111
Commerce City, Colorado 80022-2180

Office of the Program Manager for Rocky Mountain Arsenal
ATTN: AMXRM-TO: Mr. Brian L. Anderson
Rocky Mountain Arsenal, Building 111
Commerce City, Colorado 80022-2180

cc: Mr. David L. Anderson
Department of Justice
c/o Acumenics Research & Technology
999 18th Street
Suite 501, North Tower
Denver, Colorado 80202

Department of the Army
Environmental Litigation Branch
Pentagon, Room 2D444
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Mr. Thomas P. Looby
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Colorado Department of Health
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Denver, CO 80220

SHELL OIL COMMENTS
ON THE
PROPOSED DECISION DOCUMENT FOR THE NORTH BOUNDARY
SYSTEM IMPROVEMENTS INTERIM RESPONSE ACTION, JANUARY 1989

General Comments

The objectives statement (Section 3.0, page 9) for this Interim Response Action is too general and too vague to allow proper evaluation and implementation of the proposed remedial actions. A recommended objective statement of more specificity is included below under Specific Comments.

In addition, the tentative nature of the proposed remedial response actions (Section 6.0, page 16) is inconsistent with the IRA concept as set forth in the Consent Decree and seems unnecessary on the basis of the extensive investigation presented in the Alternatives Assessment Document. In particular, several of the actions as proposed involve a sequence of study-implementation-study or a variation thereon. The IRA process emphasizes speed of implementation and the use of existing information. IRAs need not be comprehensive in addressing all problems and need not necessarily provide the most optimum remedy. What an IRA cannot accomplish can be addressed in the final remedy.

In addition to delaying implementation of obviously desirable remedial actions (specifically, improvement in recharge capacity and distribution and in removal of carbon fines from effluent), the tentative nature of the proposed response actions would result in the scope of work being unbounded going into implementation document preparation and would make the setting of realistic implementation milestones problematic.

Included under Specific Comments are proposed changes to the text which are intended to sharpen the focus on the scope of work for this IRA and to allow earliest correction of the primary deficiencies affecting performance of the NBCS.

Specific Comments

1. Page 2, second from last paragraph.

In the last sentence, replace groundwater contamination with organic contaminants in the groundwater.

2. Page 5, Figure 3.

The arrows representing flow towards the northern Arsenal boundary incorrectly imply that the groundwater flow from the vicinity of Basin F is similar in magnitude to the groundwater from the vicinity of First Creek. The groundwater flow from the First Creek vicinity is much greater than the flow from the vicinity of Basin F. The arrow roughly in vicinity of Basin C and Basin F is also disproportionately large. In fact, recent hydro!ogeological investigations in this area provide evidence that this flow is almost nonexistent. Replacing this entire figure with a figure showing more up-to-date information is recommended.

3. Page 6, first paragraph of 2.1.

Since the gradient across the slurry wall varies (both with time and with position along the barrier) from north to south and from south to north, perhaps it may avoid confusion to generally refer to the south and north sides of the barrier rather than the upgradient and downgradient sides.

In the fourth sentence, we would suggest adding certain, as noted:

"...pulsed bed carbon absorbers for removing certain organics; ..."

4. Page 9, 3.0 Interim Response Action Objectives.

Substitute the following for the first paragraph of 3.0:

The goal of this IRA is timely implementation of modifications to the RMA North Boundary Control system which will enhance this system's ability to prevent the release of organic contaminants at the North Boundary.

The following specific objectives for this IRA have been selected based on the Final Alternatives Assessment document for this IRA (ESE, 1988):

- ° Increase recharge capacity and improve recharge distribution to allow achievement of a reverse alluvial groundwater gradient along the full length of the physical barrier.
- ° Reduce entrainment of granulated carbon fines into the recharge system to a practical minimum consistent with off-the-shelf equipment and accepted good operating practice for granulated carbon absorbers.
- ° Improve treatment system reliability and stream factor through modifications to equipment and operating procedures.

- Close wells within the NBCS which may provide a migration pathway from the alluvial aquifer to Denver Formation aquifers.
- Institute monitoring to measure the effects on Denver Formation aquifers of reversed alluvial aquifer gradient.

5. Page 10, first paragraph 4.1.

The 10-foot head differential at the pilot barrier no longer exists; operation of the new recharge trenches has created an alluvial reverse gradient in the pilot wall portion of the barrier. However, no reverse gradient exists over most of the length of the barrier east of the pilot portion.

Change last sentence to: "In order to reduce the head differential across the barrier, recharge system modifications will be required and some future modifications to the dewatering system could be beneficial."

6. Page 11, first three paragraphs.

A goal of a zero head difference across the barrier in areas of contaminated groundwater is not appropriate. A reverse gradient should be achieved so as to provide a measure of safety against fluctuations caused during normal operations.

7. Page 11, second full paragraph.

Recent observations indicate that the new recharge trenches have very nearly achieved the gradient reversal desired in most of the western half of the NBCTS. Further fine tuning is expected to be successful in the remaining portions of the western half of the barrier. The text should reflect these current conditions.

8. Page 12, second bullet.

It is suggested that the following statement may more accurately reflect the work referred to in this bullet:

Modifications to the pre- and post-filtering systems to improve their ability to handle solids, reduce system downtime, and minimize waste products and labor requirements.

9. Page 12, fourth bullet.

Isn't equipment sparing meant here, rather than "additional plant treatment capacity"? The combined capacity of the existing three adsorbers already far exceeds the flows through the treatment plant. Would it be more cost-effective to create the ability for off-line maintenance by using two of the adsorbers to treat the

flow, reserving the third adsorber for backup?

10. Page 12, fifth bullet.

Why are increased treatment flow rates and increased treatment capacity possibly required?

11. Page 12, third (partial) paragraph.

In the first sentence, replace (w)hile with (s)ince.

12. Page 13, first (partial) paragraph.

The text should indicate under what Consent Decree procedure the development of a strategy for inorganic treatment will occur if required in the "near term".

13. Page 13, third paragraph of 4.4.

In the last sentence, it is inappropriate to include in this IRA potential remedial actions for possible Denver Formation contamination since the need and remedy(ies) for such contamination cannot be determined at this time. In addition, injection of treated alluvial groundwater could introduce organic and inorganic contaminants into these formations.

14. Page 16, paragraph under 6.0.

Substitute for 6.0: The North Boundary Systems Improvement Response Action consists of modifications and additions to the alluvial groundwater treatment and recharge systems. Certain specific modification/addition details (e.g., recharge wells versus trenches, type of filter system, etc.) which are dependent on design analysis for selection will be determined during IRA final design and discussed in the Implementation Document.

15. Page 16, paragraph under 6.1.

At the end of the first sentence of the first bullet, add in the alluvium.

Substitute the following for the second and third bullets:

- ° Modify the treatment system to provide the following:
 - Modification or replacement of existing pre-filtration system to improve system reliability, maximize removal of suspended solids and minimize or eliminate the generation of filter medium waste material.

- Modification or replacement of existing post-filtration system to improve system reliability, maximize removal of suspended solids and minimize or eliminate the generation of filter medium waste material.
- Modification of existing carbon washing equipment and procedures to provide adequate removal of fines from virgin carbon.
- Modification of carbon system piping material and configuration to reduce generation of fines during carbon transfer operations.
- Modification of existing influent sump or provision of new wastewater basin to enhance sedimentation for removal of suspended solids.
- Modification of existing piping to allow the following:
 1. Operation of two adsorbers with utilization of the third as a standby unit.
 2. Operation of two adsorbers in series.
- Interconnection of influent sumps and/or influent pump discharge piping to provide operating flexibility and reduce system downtime.
- Modification of operating procedures to maximize utilization of carbon.

Add the following bullet:

- ° Monitor the effect of the reversed alluvial gradient on Denver Formation aquifers beneath the boundary system.

16. Page 16, 6.2 Potential Alternatives.

As discussed above in General Comments, it is inappropriate to include "potential alternatives" which are contingent on the outcome of further assessment. Therefore, this section should be deleted. However, based on present information only (including information in the Alternatives Assessment Document (ESE, 1988)), it appears that there are some dewatering modifications which will contribute to improved performance of the NBCS. For example, adjustment of probe settings and/or increased pump sizes in specific dewatering wells; also, reconstruction of existing, or addition of new, de-

watering wells in locations known to be deficient in dewatering rates. It is recommended that these or other "potential alternatives" be included for implementation without the need for further assessment.

17. Page 18, item 2.

In the last sentence, it is not clear what "this document" refers to. Probably it should be the April 29, 1988 draft ARAR document.

18. Page 20, 8.0 ARAR's.

Comments on this section are being provided by Shell in a separate letter.

RESPONSES TO COMMENTS BY SHELL OIL COMPANY
ON THE PROPOSED DECISION DOCUMENT FOR THE
NORTH BOUNDARY SYSTEM IMPROVEMENTS
INTERIM RESPONSE ACTION
JANUARY 1989

General Comments

1. The objectives statement (Section 3.0, page 9) for this Interim Response Action is too general and too vague to allow proper evaluation and implementation of the proposed remedial actions. A recommended objective statement of more specificity is included below under Specific Comments.

In addition, the tentative nature of the proposed remedial response actions (Section 6.0, page 16) is inconsistent with the IRA concept as set forth in the Consent Decree and seems unnecessary on the basis of the extensive investigation presented in the Alternatives Assessment Document. In particular, several of the actions as proposed involve a sequence of study-implementation-study or a variation thereon. The IRA process emphasizes speed of implementation and the use of existing information. IRAs need not be comprehensive in addressing all problems and need not necessarily provide the most optimum remedy. What an IRA cannot accomplish can be addressed in the final remedy.

In addition to delaying implementation of obviously desirable remedial actions (specifically, improvement in recharge capacity and distribution and in removal of carbon fines from effluent), the tentative nature of the proposed response actions would result in the scope of work being unbounded going into implementation document preparation and would make the setting of realistic implementation milestones problematic.

Included under Specific Comments are proposed changes to the text which are intended to sharpen the focus on the scope of work for this IRA and to allow earliest correction of the primary deficiencies affecting performance of the NBCS.

RESPONSE: The Army agrees that a more specific objectives statement would be appropriate for this IRA. Revisions to Section 3.0 have been made to reflect this comment. The comments on the tentative nature of the proposed alternatives in Section 6.0 have been considered, and the text revised such that no proposed action is specifically contingent upon any ongoing or future studies at the North Boundary System.

Specific Comments

1. Page 2, second from last paragraph.

In the last sentence, replace groundwater contamination with organic contaminants in the groundwater.

RESPONSE: The text has been changed to reflect this comment.

2. Page 5, Figure 3.

The arrows representing flow towards the northern Arsenal boundary incorrectly imply that the groundwater flow from the vicinity of Basin F is similar in magnitude to the groundwater from the vicinity of First Creek. The groundwater flow from the First Creek vicinity is much greater than the flow from the vicinity of Basin F. The arrow roughly in vicinity of Basin C and Basin F is also disproportionately large. In fact, recent hydrogeological investigations in this area provide evidence that this flow is almost nonexistent. Replacing this entire figure with a figure showing more up-to-date information is recommended.

RESPONSE: The arrows on Figure 3 have been reduced in size to de-emphasize the flows north of Basin F and from the vicinity of Basin C. The referenced source has been deleted. A note has been added to indicate that arrows are indicative of direction of flow and do not represent flow quantities.

3. Page 6, first paragraph of 2.1.

Since the gradient across the slurry wall varies (both with time and with position along the barrier) from north to south and from south to north, perhaps it may avoid confusion to generally refer to the south and north sides of the barrier rather than the upgradient and downgradient sides.

In the fourth sentence, we would suggest adding certain, as noted:

"...pulsed bed carbon absorbers for removing certain organics; ..."

RESPONSE: The text has been changed to reflect this comment.

4. Page 9, 3.0 Interim Response Action Objectives.

Substitute the following for the first paragraph of 3.0:

The goal of this IRA is timely implementation of modifications to the RMA North Boundary Control system which will enhance this system's ability to prevent the release of organic contaminants at the North Boundary.

The following specific objectives for this IRA have been selected based on the Final Alternatives Assessment document for this IRA (ESE, 1988):

- o Increase recharge capacity and improve recharge distribution to allow achievement of a reverse alluvial groundwater gradient along the full length of the physical barrier.
- o Reduce entrainment of granulated carbon fines into the recharge system to a practical minimum consistent with off-the-shelf equipment and accepted good operating practice for granulated carbon absorbers.
- o Improve treatment system reliability and stream factor through modifications to equipment and operating procedures.
- o Close wells within the NBCS which may provide a migration pathway from the alluvial aquifer to Denver Formation aquifers.
- o Institute monitoring to measure the effects on Denver Formation aquifers of reversed alluvial aquifer gradient.

RESPONSE: The text has been changed to reflect this comment. However, while monitoring will be performed to measure the effects on the Denver Formation of ongoing gradient reversals, it is not considered appropriate for monitoring changes/additions to be included as an IRA objective.

5. Page 10, first paragraph 4.1.

The 10-foot head differential at the pilot barrier no longer exists; operation of the new recharge trenches has created an alluvial reverse gradient in the pilot wall portion of the barrier. However, no reverse gradient exists over most of the length of the barrier east of the pilot portion.

Change last sentence to: "In order to reduce the head differential across the barrier, recharge system modifications will be required and some future modifications to the dewatering system could be beneficial."

RESPONSE: The second paragraph on page 11 has been expanded to indicate the current status of the hydraulic gradient based on preliminary findings from evaluation of the western section of the North Boundary System. The last sentence of paragraph one of Section 4.1 has been changed to reflect the second comment.

6. Page 11, first three paragraphs.

A goal of a zero head difference across the barrier in areas of contaminated groundwater is not appropriate. A reverse gradient should be achieved so as to provide a measure of safety against fluctuations caused during normal operations.

RESPONSE: The text of the first three paragraphs on page 11 have been changed to indicate the goal as being to create a reverse gradient to reflect this comment.

7. Page 11, second full paragraph.

Recent observations indicate that the new recharge trenches have very nearly achieved the gradient reversal desired in most of the western half of the NBCTS. Further fine tuning is expected to be successful in the remaining portions of the western half of the barrier. The text should reflect these current conditions.

RESPONSE: See the response to Specific Comment 5.

8. Page 12, second bullet..

It is suggested that the following statement may more accurately reflect the work referred to in this bullet:

Modifications to the pre- and post-filtering systems to improve their ability to handle solids, reduce system downtime, and minimize waste products and labor requirements.

RESPONSE: The text has been changed to reflect this comment.

9. Page 12, fourth bullet.

Isn't equipment sparing meant here, rather than "additional plant treatment capacity"? The combined capacity of the existing three adsorbers already far exceeds the flows through the treatment plant. Would it be more cost-effective to create the ability for off-line maintenance by using two of the adsorbers to treat the flow, reserving the third adsorber for backup?

RESPONSE: The text has been changed to reflect this comment.

10. Page 12, fifth bullet.

Why are increased treatment flow rates and increased treatment capacity possibly required?

RESPONSE: Agreed that increased treatment flow rates and increased treatment capacity may not be required. The text has been changed to reflect this comment.

11. Page 12, third (partial) paragraph.

In the first sentence, replace (w)hile with (s)ince.

RESPONSE: The text has been changed to reflect this comment. .

12. Page 13, first (partial) paragraph.

The text should indicate under what Consent Decree procedure the development of a strategy for inorganic treatment will occur if required in the "near term."

RESPONSE: Consistent with the Army's approach to the cleanup, any modification to this IRA will be raised with all parties at the RMA Committee level.

13. Page 13, third paragraph of 4.4.

In the last sentence, it is inappropriate to include in this IRA potential remedial actions for possible Denver Formation contamination since the need and remedy(ies) for such contamination cannot be determined at this time. In addition, injection of treated alluvial groundwater could introduce organic and inorganic contaminants into these formations.

RESPONSE: Agreed. The text has been changed to reflect this comment.

14. Page 16, paragraph under 6.0.

Substitute for 6.0: The North Boundary Systems Improvement Response Action consists of modifications and additions to the alluvial groundwater treatment and recharge systems. Certain specific modification/addition details (e.g., recharge wells versus trenches, type of filter system, etc.) which are dependent on design analysis for selection will be determined during IRA final design and discussed in the Implementation Document.

RESPONSE: Both the text and the format of Section 6.0 have been revised to more closely reflect recommendations made in this comment and specific comments 15 and 16. The introductory paragraph of Section 6.0 should continue to address the

dewatering alternative, however, as alluded to in Specific Comment 16.

15. Page 16, paragraph under 6.1.

At the end of the first sentence of the first bullet, add in the alluvium.

Substitute the following for the second and third bullets:

- o Modify the treatment system to provide the following:
 - Modification or replacement of existing pre-filtration system to improve system reliability, maximize removal of suspended solids and minimize or eliminate the generation of filter medium waste material.
 - Modification or replacement of existing post-filtration system to improve system reliability, maximize removal of suspended solids and minimize or eliminate the generation of filter medium waste material.
 - Modification of existing carbon washing equipment and procedures to provide adequate removal of fines from virgin carbon.
 - Modification of carbon system piping material and configuration to reduce generation of fines during carbon transfer operations.
 - Modification of existing influent sump or provision of new wastewater basin to enhance sedimentation for removal of suspended solids.
 - Modification of existing piping to allow the following:
 1. Operation of two adsorbers with utilization of the third as a standby unit.
 2. Operation of two adsorbers in series.
 - Interconnection of influent sumps and/or influent pump discharge piping to provide operating flexibility and reduce system downtime.
 - Modification of operating procedures to maximize utilization of carbon.

Add the following bullet:

- o Monitor the effect of the reversed alluvial gradient on Denver Formation aquifers beneath the boundary system.

RESPONSE: The text has been changed to reflect this first comment. The second and third bullets have been revised to more closely reflect recommendations made in the second comment. However, the last recommendation of this comment regarding monitoring of the Denver Formation gradient has not been included as discussed in response to Specific Comment 4.

16. Page 16, 6.2 Potential Alternatives.

As discussed above in General Comments, it is inappropriate to include "potential alternatives" which are contingent on the outcome of further assessment. Therefore, this section should be deleted. However, based on present information only (including information in the Alternatives Assessment Document (ESE, 1988)), it appears that there are some dewatering modifications which will contribute to improved performance of the NBCS. For example, adjustment of probe settings and/or increased pump sizes in specific dewatering wells; also, reconstruction of existing, or addition of new, dewatering wells in locations known to be deficient in dewatering rates. It is recommended that these or other "potential alternatives" be included for implementation without the need for further assessment.

RESPONSE: Section 6.0 has been revised as indicated previously in response to Specific Comment 14. Section 6.2 has been deleted but two of the alternatives previously listed under 6.2 are retained in 6.1 as planned modifications/additions.

17. Page 18, item 2.

In the last sentence, it is not clear what "this document" refers to. Probably it should be the April 29, 1988 draft ARAR document.

RESPONSE: The text has been changed to reflect this comment.

18. Page 20, 8.0 ARARs.

Comments on this section are being provided by Shell in a separate letter.

RESPONSE: None required here. See responses to Shell's separate letter addressing ARARs.

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February 22, 1989

Hand Delivery

Mr. Donald L. Campbell
Office of the Program Manager for Rocky Mountain Arsenal
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Commerce City, Colorado 80022-2180

Re: Shell Oil Company Comments on ARARs Section of
Proposed Decision Document for the North
Boundary Improvements IRA

Dear Mr. Campbell:

With the exception of the compounds identified below, Shell's positions regarding chemical-specific ARARs for this IRA have been provided to the Army in comments on the Potential Ambient or Chemical-specific ARARs for Treatment of Contaminants by the North Boundary System. Letter from E.J. McGrath to Donald L. Campbell, May 27, 1988. Shell continues to object to the rejection by the Army of our initial comments.

Chemical-Specific ARARs

Shell objects to the inclusion of limits for arsenic and fluoride since this IRA is not intended to address inorganic compounds, but rather to enhance the ability of the system to prevent the release of organic contaminants at the North Boundary.

Shell strongly disagrees with the .20 ug/l level for DBCP, which is described as a "groundwater IRA standard." That level is not an ARAR and the listing of this level under an ARARs analysis is unsupportable and inconsistent with CERCLA. Under section 121(d)(2) of CERCLA, ARARs can cover only a standard, requirement, criteria, or limitation under environmental laws. The level listed for DBCP is a detection

Mr. Donald L. Campbell
February 22, 1989
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limit and does not relate to protection of human health and the environment.

Shell also objects to the so-called "groundwater IRA standard" of 9,730 ug/l for DIMP, based on an October 1984 document issued by the U.S. Army Medical Bioengineering Research and Development Laboratory. That level also is not a standard, requirement, criteria or limitation under an environmental law and therefore is not an ARAR. In addition, both Shell and the Army have conducted risk assessments of DIMP which contain more current and accurate information.

The Army's proposal of 7 ug/l as an ARAR for 1,2-dichloroethylene based on 40 C.F.R. § 141.61(a) appears to be in error since this isomer of dichloroethylene has not been proposed as an MCL. The Army has apparently confused the 1,2-isomer with the 1,1-isomer for which an MCL exists. 52 Fed. Reg. 25,716 (July 8, 1987).

Shell objects to the toxic pollutant emission standards of 10 ug/l and .12 ug/l for DDT and dieldrin. Shell disagrees with the assumption underlying these criteria that there is not a demonstrated no effect level. See 41 Fed. Reg. 23587 (1986). As Shell has previously explained in comments, developments in modelling, such as the Sielken model, indicate that the assumption is invalid. In addition, a water quality criteria designed to provide for protection of aquatic life is not relevant and appropriate. The criteria were intended to address bioaccumulation in aquatic organisms. 41 Fed. Reg. 23587 (1976). Since fish are not exposed to treated water at the North Boundary, the criterion is not relevant and appropriate. Further, as stated in previous comments, numerous carcinogenicity tests in a variety of animals indicate that dieldrin promotes only liver tumors and the tumors develop only in mice. On the basis of this species-specific effect, dieldrin is improperly categorized by the EPA as an animal carcinogen.

Shell disagrees with the Army proposal of the water quality criteria of 1,400 ug/l as an ARAR for ethyl benzene. This value has been derived from non-referenced sources for the protection of human health. The references do not advise the reader on the toxicological endpoints considered or the

Mr. Donald L. Campbell
February 22, 1989
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assumptions incorporated in performing the calculations for values protective of human health.

The selection of water quality criteria as ARARs for hexachlorocyclopentadiene, tetrachloroethylene and toluene cannot be supported. Shell's positions regarding groundwater ARARs based on ambient water quality criteria (AWQC) is set forth in a letter from Edward J. McGrath to Charles Scharmann, dated June 21, 1988, commenting on the IRA North of RMA. Shell has also submitted comments to the Army stating that the aquatic life values are merely published as guidance, and do not constitute an ambient water quality criteria. See letter of Edward J. McGrath to Donald L. Campbell, June 17, 1988. In many instances, the values cited by the Army as the basis of proposed ARARs are based upon the assumption of factors for the human consumption of drinking water and aquatic life. Naturally, fish are not collected from groundwater. Therefore, aquatic life values are not potential ARARs for groundwater on the RMA. In addition, the tetrachloroethylene level is based on CAG values, which provide no true estimation of risk.

To the extent that additional chemical-specific ARARs are established, Shell reserves the right to comment.

Location-Specific ARARs

Shell's comments regarding potential location-specific ARARs, viz, siting requirements for public water systems, have been provided to the Army during the past year in comments regarding various IRA activities. Letter from E.J. McGrath to Donald L. Campbell (May 31, 1988).

Performance or other Action-Specific ARARs

Shell's comments regarding air emissions and worker protection standards have been provided to the Army in response to other IRA activities. Letter from E.J. McGrath to Donald L. Campbell (May 18, 1988).

Removal of Soil

The document should clarify that substantive RCRA provisions do not apply to soil that is returned to the

Mr. Donald L. Campbell
February 22, 1989
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location from which it originated. See proposed NCP, 53 Fed.
Reg. 5144 (Dec. 21, 1988).

Very truly yours,

Edward J. McGrath/cen
Edward J. McGrath

EJM/jah

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Mr. Donald L. Campbell
February 22, 1989
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RESPONSES TO COMMENTS BY SHELL OIL COMPANY ON THE
ARARS SECTION OF THE PROPOSED DECISION DOCUMENT FOR
THE NORTH BOUNDARY SYSTEM IMPROVEMENTS
INTERIM RESPONSE ACTION
JANUARY 1989

Chemical-Specific ARARs

1. Shell objects to the inclusion of limits for arsenic and fluoride since this IRA is not intended to address inorganic compounds, but rather to enhance the ability of the system to prevent the release of organic contaminants at the North Boundary.

RESPONSE: The selected treatment system is anticipated to attain the listed standards through its operation. The Army attempts to identify all standards for relevant compounds and to indicate whether attainment of the standards is anticipated.

2. Shell strongly disagrees with the .20 ug/l level for DBCP, which is described as a "groundwater IRA standard." That level is not an ARAR and the listing of this level under an ARARS analysis is unsupportable and inconsistent with CERCLA. Under Section 121(d)(2) of CERCLA, ARARS can cover only a standard, requirement, criteria, or limitation under environmental laws. The level listed for DBCP is a detection limit and does not relate to protection of human health and the environment.

RESPONSE: This level has been the operating parameter of the system for some time. The Army intends to continue operation at that level.

3. Shell also objects to the so-called "groundwater IRA standard" of 9,730 ug/l for DIMP, based on an October 1984 document issued by the U.S. Army Medical Bioengineering Research and Development Laboratory. That level also is not a standard, requirement, criteria or limitation under an environmental law and therefore is not an ARAR. In addition, both Shell and the Army have conducted risk assessments of DIMP which contain more current and accurate information.

RESPONSE: The Army agrees that more recent data for DIMP exists. The EPA health assessment identifies levels between 600 ug/l and 3000 ug/l, depending on the method of exposure. The level for DIMP is not an ARAR because it is not a promulgated standard, criteria, or limitation as defined in CERCLA, Section 121(d). Even though a level has not been promulgated, the Army anticipates it can achieve the minimum EPA level of 600 ug/l.

4. The Army's proposal of 7 ug/l as an ARAR for 1,2-dichloroethylene based on 40 C.F.R. Sec. 141.61(a) appears

to be in error since this isomer of dichloroethylene has not been proposed as an MCL. The Army has apparently confused the 1,2-isomer with the 1,1-isomer for which an MCL exists. 52 Fed. Reg. 25,716 (July 8, 1987).

RESPONSE: The Army has revised the document based on Shell's comment.

5. Shell objects to the toxic pollutant emission standards of 10 ug/l and .12 ug/l for DDT and dieldrin. Shell disagrees with the assumption underlying these criteria that there is not a demonstrated no effect level. See 41 Fed. Reg. 23857 (1986). As Shell has previously explained in comments, developments in modelling, such as the Sielken model, indicate that the assumption is invalid. In addition, a water quality criteria designed to provide for protection of aquatic life is not relevant and appropriate. The criteria were intended to address bioaccumulation in aquatic organisms. 41 Fed. Reg. 23587 (1976). Since fish are not exposed to treated water at the North Boundary, the criterion is not relevant and appropriate. Further, as stated in previous comments, numerous carcinogenicity tests in a variety of animals indicate that dieldrin promotes only liver tumors and the tumors develop only in mice. On the basis of this species-specific effect, dieldrin is improperly categorized by the EPA as an animal carcinogen.

RESPONSE: EPA, as the primary federal technical agency in this area for the United States, is responsible for determining appropriate methodology and standards. The Army accepts the methodology and standards established by EPA.

The standards to protect aquatic life are relevant and appropriate to this IRA because recharged groundwater may seep into nearby surface waters which support aquatic life, such as First Creek and O'Brian Canal.

6. Shell disagrees with the Army proposal of the water quality criteria of 1,400 ug/l as an ARAR for ethyl benzene. This value has been derived from non-referenced sources for the protection of human health. The references do not advise the reader on the toxicological endpoints considered or the assumptions incorporated in performing the calculations for values protective of human health.

RESPONSE: CERCLA, Section 121, specifically identifies Ambient Water Quality Criteria as potential ARARs.

7. The selection of water quality criteria as ARARs for hexachlorocyclopentadiene, tetrachloroethylene and toluene cannot be supported. Shell's positions regarding groundwater ARARs based on ambient water quality criteria (AWQC) is set forth in a letter from Edward J. McGrath to Charles Scharmann, dated June 21, 1988, commenting on the

IRA North of RMA. Shell has also submitted comments to the Army stating that the aquatic life values are merely published as guidance, and do not constitute an ambient water quality criteria. See letter of Edward J. McGrath to Donald L. Campbell, June 17, 1988. In many instances, the values cited by the Army as the basis of proposed ARARs are based upon the assumption of factors for the human consumption of drinking water and aquatic life. Naturally, fish are not collected from groundwater. Therefore, aquatic life values are not potential ARARs for groundwater on the RMA. In addition, the tetrachloroethylene level is based on CAG values, which provide no true estimation of risk.

RESPONSE: See Response to Comment 5.

To the extent that additional chemical-specific ARARs are established, Shell reserves the right to comment.

Location-Specific ARARs

8. Shell's comments regarding potential location-specific ARARs viz., siting requirements for public water systems, have been provided to the Army during the past year in comments regarding various IRA activities. Letter from E. J. McGrath to Donald L. Campbell (May 31, 1988).

RESPONSE: The Army has previously responded to the concerns raised by Shell relating to this matter and refers to those responses.

Performance or other Action-Specific ARARs

9. Shell's comments regarding air emissions and worker protection standards have been provided to the Army in response to other IRA activities. Letter from E.J. McGrath to Donald L. Campbell (May 18, 1988).

RESPONSE: See Response to Comment 8.

Removal of Soil

10. The document should clarify that substantive RCRA provisions do not apply to soil that is returned to the location from which it originated. See proposed NCP, 53 Fed. Reg. 5144 (Dec. 21, 1988).

RESPONSE: The document has been revised in response to this comment.

February 21, 1989

Program Manager for
Rocky Mountain Arsenal
Building 111
Rocky Mountain Arsenal
Commerce City, CO 80022-2180

Attention: Donald L. Campbell

Dear Mr. Campbell:

This letter is written on response to public comments on the north boundary system improvements IRA.

Having read the available and appropriate information and attending the public meeting held February 16, 1989, we feel this IRA closely parallels with the groundwater intercept and treatment system north of the Rocky Mountain Arsenal IRA. Both IRA's address the fact that chemical contaminants are escaping off the arsenal north boundary similar to a saturated sponge. The very fact that the need exists for an off-post groundwater treatment plant at this location suggests the ineffectiveness of the present system. In the past, we felt we lived approximately one mile from perhaps the "most contaminated area in the world". Now we are beginning to feel no longer from but part of perhaps the "most contaminated area in the world".

With concern and consideration we feel that:

1) The present system though "dependable" is ineffective and unreliable. In spite of the expansion done, improvements made, and studies conducted in the early to mid eighties the system has not been able to completely rid ground water of contaminants. We constantly see maintenance, repairs, or both being done on a daily basis along the north boundary system from Highway 2 to First Creek. The groundwater cannot be deemed 100% clean, much like the leaky saturated sponge. We then are left with action levels as a basis of our health and safety. This may be an indicator for the groundwater, however, the soil and the contaminants carried through the soil are still present and carried off the arsenal.

2) The building of an off-post water treatment system along the north boundary is needed in addition to improvements of the north boundary system.

3) North boundary residents safety and well-being should not be compromised in this IRA process. These moving contaminants have hurt us significantly already and pose an ongoing threat to our health and well-being.

4) Interim measures presented in the letter of February 6, 1989 in response to groundwater intercept and treatment system north of Rocky Mountain Arsenal IRA are again applicable to this IRA. For reference these are listed as follows:

a) A recommendation included on this IRA that residents living along East 96th Avenue from Highway 2 to First Creek be compensated to enable affected residents to relocate. This is based on known movement of contamination towards the north boundary and cumulative unsafe unknown health hazards. We suggest this be extended to include all affected residents on the north boundary. This recommendation is presented as a preventive health measure.

b) Deep well water be tested bi-yearly. We suggest the months of February and August. We ask that these results are available in a 4-6 week period and that the results are complete with values used. We ask that test results are accurate and noted where and by whom testing was done and the name of a reference person residents may contact for further explanation. Furthermore, we ask that results be mailed directly to the appropriate resident.

c) Supplying of bottled water at no cost to residents living along East 96th Avenue from Highway 2 to First Creek until treatment plant is built and operational.

d) Ground sampling continue on a regular basis four (4) times a year based on seasonal changes i.e., winter, spring, summer, autumn. We ask that results be accurate and are available in a 4-6 week period and mailed directly to residents. We ask that included with results is where and by whom testing was done and the name of a reference person residents may contact for further explanation.

e) Air sampling continued with a monthly report sent by mail to area residents. Please include with this report a list of normal values and a reference person residents may contact for further explanation.

f) Public meetings at Stapleton Plaza are continued on a monthly basis.

g) Feedback on submitted comments included on the agenda at the public meetings.

h) At the public meeting of February 16, 1989, it was indicated that meetings would not be held on a regular monthly basis. Therefore, please relate feedback in a written letter to residents.

In summary, we feel the above are significant comments and sincerely ask that due consideration be given.

Respectfully submitted,

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Out-of-town at time this
letter was written.
Contacted per phone and
in agreement.

Albert L. Maul

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REPLY TO
ATTENTION OF

DEPARTMENT OF THE ARMY
PROGRAM MANAGER FOR ROCKY MOUNTAIN ARSENAL
ABERDEEN PROVING GROUND, MARYLAND 21010-5401



April 3, 1989

Interim Response Division

Dear Resident:

Thank you for your letter. After review of your concerns, the Army would like to provide some general information about the North Boundary System (NBS) performance, past and present.

The NBS is a fixed, engineered treatment system. As such, it must passively wait for contaminants in the soil and groundwater to approach it from the south. Once at the NBS, the contaminated groundwater can be extracted, treated, and then recharged on the clean or north side of the system. The mere fact that a groundwater system is in place does not imply that all nearby groundwater must instantly be contaminant free for the system to be effective. Groundwater approaching the NBS from the south side will be contaminated for many years to come, hence the need for the boundary system. Also, the fact that daily upkeep and repair of the NBS can be seen from your homes does not imply that the system is unreliable, rather, the message that it should give you is that the Army is committed to and wishes for this system to operate at peak efficiency at all times.

Finally, let me clear up a misunderstanding in your letter. Chemical contaminants are not escaping the NBS like water leaking from a saturated sponge. What was meant by this example given at the public meeting is that prior to installation of the NBS, contaminants that had already migrated north of the Arsenal had been absorbed by the soil, much like a sponge. Now, even though only clean treated groundwater is flowing off the Arsenal, contaminants will still be detected in the groundwater north of the Arsenal as they de-absorb from the soil. This presence does not mean that the NBS is ineffective. Rather, it implies the need for an off post intercept and treatment system further downstream which is the purpose of the off post Interim Response Action (IRA).

Specific responses to your comments are provided below by the paragraph numbers used in your letter:

Comment 1:

Response: While no known water treatment system can remove every single molecule of foreign material in groundwater, the treated effluent achieves appropriate treatment standards. Even though no one is drinking water treated by the NBS, the effluent discharge from the system is well within

EPA drinking water standards. After this project for improvements to the system is completed, the system will be even more effective. Additional systems are planned within the Arsenal boundaries to reduce the level of contamination in the groundwater entering the boundary systems. The off post treatment system is primarily intended to capture contamination which migrated off the Arsenal in the time period before the boundary treatment systems were in operation.

Comment 2:

Response: The Army is committed to constructing a groundwater treatment system off of Rocky Mountain Arsenal (RMA). This system will be constructed as part of the IRA entitled "Groundwater Intercept and Treatment System North of RMA." The plans for this IRA were outlined in a proposed Decision Document released on December 30, 1988 and were also discussed at a public meeting held at the Stapleton Plaza Hotel on January 17, 1989.

Comment 3:

Response: The IRA process has been established to minimize the potential for contaminants to migrate from RMA and create health risks to off post residents. The IRAs are also intended to initiate restoration of RMA and the surrounding environment as soon as possible. Although contamination has been detected on and around your properties, the assessment of the concentrations and the routes through which you could be exposed to these contaminants does not indicate that a health threat exists. We will continue to update this assessment as additional data become available. If at any time a health risk is identified to exceed guidelines established by EPA, actions will be taken to protect you from such risk.

Comment 4a:

Response: As previously stated, our data collected to date do not indicate that a health threat exists to residents off post. We are continuing to collect data in an effort to complete a more thorough risk assessment. If at any time a health risk is identified to exceed guidelines established by EPA, actions will be taken to protect you from such risk.

Comment 4b:

Response: We agree that a routine chemical analysis program should be conducted for residents living immediately north of RMA. Based on previous results from samples collected from your wells, the quality of your drinking water is actually quite good. However, to insure that the quality does not change in the future, a full analysis for RMA-related contaminants will be conducted on an annual basis. Additional tests (hardness, conductivity, etc.) will be conducted on a semi-annual basis to monitor potential changes in water quality. By comparing the results of these tests (hardness, etc.) on a semi-annual basis, this provides a good indicator of whether the quality of water could be changing from the time of the last full chemical analysis. If these tests indicate that the water quality may have changed, another analysis (in addition to the annual sample analysis) will be conducted to determine the water quality.

Comment 4c:

Response: As noted in response to Comment 4b., the water quality of drinking water wells along 96th Avenue is quite good. Provision of bottled water is considered a temporary measure for those residents with contamination in their drinking water at levels above EPA guidelines. Bottled water would only be provided until a permanent alternate water source (e.g. deep well, hook-up to SACWSD distribution system) could be provided.

Because your drinking water does not have RMA related contaminants at any level, provision of bottled water or any other alternate water source is not considered necessary. If at any time in the future, chemical analyses from your wells indicate that RMA related contaminants are present at levels above EPA guidelines, actions to provide an alternate source of water will be taken.

Comment 4d:

Response: We agree that additional ground sampling is necessary on and around your properties. This sampling will take place at different times throughout the year to attempt to evaluate any seasonal changes that may occur. Plans for the sampling will be fully coordinated with residents along 96th Avenue and First Creek. We also would like to solicit input from residents in an effort to make these programs address your concerns. Data from those programs will be provided directly to the residents as soon as it becomes available. The data package provided to you will include the information requested in your comments (results, where and by whom sampling was done, and a point of contact for further information). We will attempt to provide the data package within a 4-6 week period; however due to laboratory delays, this may not always be possible.

Comment 4e:

Response: While air sampling is not a part of this IRA, it is part of the ongoing program of monitoring Basin F and will continue. Data from the Basin F monitoring program will be provided directly to the residents as it becomes available, although results may not always be available within a month due to potential laboratory delays. We assume by "normal values" you mean the background levels of ambient air. Background levels can be provided to you with results of measured values, but it is anticipated that measured values will be equivalent to background levels since the Basin F project (including the waste pile cap) has been completed.

Comment 4f:

Response: Public meetings will be held as required for public comment on the various projects at the Arsenal.

Comment 4g:

Response: Comments submitted during public meetings concerning specific projects are addressed in the written response to comments contained in the Draft Final Decision Document. Other written comments received will be addressed individually.

Comment 4h:

Response: See response to Comment 4f.

In closing, your concerns were given due consideration. This IRA will be implemented as quickly as possible. If you have any further questions, please address them to the attention of the undersigned.

Sincerely,



Donald L. Campbell
Deputy Program Manager,
Rocky Mountain Arsenal